

PRIMARY 3

MATHEMATICS

Teacher's Guide
2020/2021

Term 1

FOREWORD

This is a pivotal time in the history of the Ministry of Education and Technical Education (MOETE) in Egypt. We are embarking on the transformation of Egypt's K-12 education system starting in September 2018 with KG1, KG2 and Primary 1 continuing to be rolled out year after year until 2030. We are transforming the way in which students learn to prepare Egypt's youth to succeed in a future world that we cannot entirely imagine.

MOETE is very proud to present this new series of textbooks, Discover, with the accompanying digital learning materials that captures its vision of the transformation journey. This is the result of much consultation, much thought and a lot of work. We have drawn on the best expertise and experience from national and international organizations and education professionals to support us in translating our vision into an innovative national curriculum framework and exciting and inspiring print and digital learning materials.

The MOETE extends its deep appreciation to its own "Center for Curriculum and Instructional Materials Development" (CCIMD) and specifically, the CCIMD Director and her amazing team. MOETE is also very grateful to the minister's senior advisors and to our partners including "Discovery Education," "Nahdet Masr," "Longman Egypt," UNICEF, UNESCO, and WB, who, collectively, supported the development of Egypt's national curriculum framework. I also thank the Egyptian Faculty of Education professors who participated in reviewing the national curriculum framework. Finally, I thank each and every MOETE administrator in all MOETE sectors as well as the MOETE subject counselors who participated in the process.

This transformation of Egypt's education system would not have been possible without the significant support of Egypt's current president, His Excellency President Abdel Fattah el-Sisi. Overhauling the education system is part of the president's vision of 'rebuilding the Egyptian citizen' and it is closely coordinated with the ministries of higher education & scientific research, Culture, and Youth & Sports. Education 2.0 is only a part in a bigger national effort to propel Egypt to the ranks of developed countries and to ensure a great future to all of its citizens.

WORDS FROM THE MINISTER OF EDUCATION & TECHNICAL EDUCATION

It is my great pleasure to celebrate this extraordinary moment in the history of Egypt where we launch a new education system designed to prepare a new Egyptian citizen proud of his Egyptian, Arab and African roots - a new citizen who is innovative, a critical thinker, able to understand and accept differences, competent in knowledge and life skills, able to learn for life and able to compete globally.

Egypt chose to invest in its new generations through building a transformative and modern education system consistent with international quality benchmarks. The new education system is designed to help our children and grandchildren enjoy a better future and to propel Egypt to the ranks of advanced countries in the near future.

The fulfillment of the Egyptian dream of transformation is indeed a joint responsibility among all of us; governmental institutions, parents, civil society, private sector and media. Here, I would like to acknowledge the critical role of our beloved teachers who are the role models for our children and who are the cornerstone of the intended transformation.

I ask everyone of us to join hands towards this noble goal of transforming Egypt through education in order to restore Egyptian excellence, leadership and great civilization.

My warmest regards to our children who will begin this journey and my deepest respect and gratitude to our great teachers.

Dr. Tarek Galal Shawki
Minister of Education & Technical Education

Contents

How to Use This Guide



The Mathematics Teacher Guide is designed to support instructors in the preparation and implementation of rich and engaging learning experiences. It provides clear step-by-step instructions embedded with teacher input, instructional strategies, and classroom management techniques. In these learning experiences, students explore, play, use manipulatives, communicate and collaborate with colleagues, ask and seek answers to questions, and practice new skills and concepts.

This instructional approach aims to help students accomplish the following goals:
- Build numeracy
- Discover connections between and among math concepts
- Develop computational fluency
- Acquire and use math vocabulary
- Build awareness of measurement and geometry concepts
- Enhance critical thinking, problem solving, collaboration, and communication
- Increase enjoyment of math

If instructors have not used such a guide before, some practical advice follows:
- Read each chapter carefully. Make notes and highlight important details.
- Take particular note of sections labeled Term, Chapter, or Lesson Preparation. These sections include steps the teacher will need to complete in order to implement the learning experiences in the term, chapters, and lessons. Advance preparation will ease the instructor's workload and ensure successful learning experiences for students.
- Gather the necessary materials and make any preparations before implementing the lessons.
- Consider additional classroom management techniques necessary for your particular class and learning environment.

There is a Mathematics Student Book for Primary 3. The student book contains Connect, Apply, and Math Journal pages, as well as Challenge problems (for some lessons).

Connect pages:
- Connect pages provide a space for students to record their work and thinking as they participate in the Connect activity.
- Students work independently, in pairs, in small groups, or with the whole class to develop computational fluency.
- Students work with the teacher to build connections between prior knowledge and new learning.

Apply pages:
- Apply pages provide an opportunity for students to immediately practice the content they are learning in class.
- Students work independently, in pairs, or in small groups to explore, discover, and apply new skills and concepts.
- Students have multiple opportunities to check their work and the work of others. This kind of error analysis strengthens students' learning and deepens their understanding of mathematical concepts and connections.
- Students can extend their learning by solving Challenge problems that require them to apply skills and concepts in a new context.
- Apply pages are a wonderful resource for informally assessing student progress.

Math Journal pages:

- Students reflect on their learning through drawing, writing, and completing related math activities.
- The Math Journal pages provide opportunities for students to make connections between new content and previous learning and between formal math concepts and the real world.
- Like the Apply pages, the Math Journal pages are a great resource for informally assessing student progress and gathering information about students' current understanding and potential misconceptions.

The information you gather from the Apply pages and the Math Journal pages can be used to plan future instruction and differentiation. (See Formative Assessment, below.)

Take note of the following:

- What are students discovering or learning? (Content)
- What are students' misconceptions or misunderstandings? (Remediation)
- What are students being asked to do? (Activity)
- What is the teacher discovering about students? (Assessment)
- How could you adapt the lesson for the different abilities in your class? (Differentiation)

During and after the implementation of each lesson, reflect and make notes on what was successful as well as possible suggestions for improvement.

Planning with another instructor can often lead to greater implementation success as it provides an opportunity to discuss classroom expectations, management procedures, and strategies for differentiation according to the needs of students. It is suggested that teachers meet with other instructors at least weekly to plan and reflect.

Background

Building off the success of the initial year of Education 2.0 implementation, these instructional materials support the production of engaging and rigorous learning experiences for students and teachers. In this Teacher Guide, mathematics instruction is divided into Chapters. Each Chapter includes 10 days of instruction. The teaching of mathematics and the building of numeracy is linear, with students learning new content in increments and adding to their conceptual development and understanding slowly over time.

Lesson organization
At the beginning of each lesson, the Teacher Guide provides the following:

- **Lesson Overview** provides a brief synopsis of the learning activities and learning goals of the lesson.
- **Learning Objectives** identify the student learning targets of the lesson.
- **Key Vocabulary** introduces mathematics vocabulary critical to building students' understanding of a concept.
- **Lesson Preparation** provides a general overview of preparation needed for successful implementation of the lesson. This section may direct teachers to consult Chapter Preparation for the Teacher for additional details, examples, and instructions.
- **Lesson Materials** lists all materials needed for successful implementation of the lesson.

Mathematics lessons are organized into three components:

- **Connect (10-15 minutes)**
  - During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.

- **Learn (35-45 minutes)**
  - During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.

- **Reflect (5-10 minutes)**
  - During this daily routine, students develop their ability to express mathematical ideas by talking about their discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from their peers' perspectives.

Some instructional considerations
Each section should be implemented every day. However, in some cases, students may need a few more minutes for one section and another section (or two) will have to be shortened for that day. The instructor should use personal judgment and knowledge of student needs to allocate lesson time.

Story problems and numbers are provided as examples throughout the Teacher Guide. The instructor can use the story and numbers provided or create stories to suit the needs of the students. If the numbers in a story problem or sample problem are changed, be sure to limit the quantities to those identified in the indicators and outcomes (for example, "up to 1,000").

The instructor is encouraged to incorporate familiar counting songs, poems, rhymes, math stories/literature, and math games and activities that are not included in this Teacher Guide.



Learn more about Education 2.0

Instructional Strategies

Many of the instructional strategies described below are woven throughout the Teacher Guide. These are not meant to be the only methods used in the classroom; rather they are highlighted as best practices for engaging students in active, inquiry-based learning. As teachers and students gain familiarity with the strategies, instructors may wish to modify and personalize to suit the needs of each individual classroom.

For more strategies visit: tinyurl.com/Edu2-0strategies



INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
2 Stars and a Wish	This strategy is used to help students give positive feedback to peers. Two stars are two things the student likes about the work that is being evaluated. One wish is a suggestion to improve upon that work.
Ask 3 Before Me	Students ask three peers for assistance before asking the teacher. This strategy is used when students are working collaboratively to develop communication skills, encourage peer interactions, and decrease reliance on the teacher's support in large classrooms.
Attention Getting Signal	The teacher uses an explicit signal to get the attention of the class when they are talking in pairs or working in groups. There are many options for signals, and more than one can be used as long as students recognize it. Options include a clap pattern that students repeat, a simple call and response phrase, or a hand in the air (see: Hands Up). This strategy allows teachers to ask for students' attention without shouting or immediately disrupting student conversations.
Brainstorm	Students provide multiple answers for an open-ended question. This can be done as a whole class or in groups or pairs. The purpose of a brainstorm is to list many answers, not to critique whether answers are realistic, feasible, or correct. Once an initial broad list is made, students can go back to answers to prioritize or eliminate some options. This strategy promotes creativity and problem-solving.
Calling Sticks	Teacher writes the names of students on popsicle sticks and places them in a can/jar. To call randomly on students, the teacher pulls a stick from the jar. After calling on the student, the teacher places that stick into another can/jar so that student is not immediately called on again. This strategy helps teachers call on a wide variety of students and encourages all students to be ready with an answer.
Count Off	Teacher breaks students into groups by having students count off to a certain number. It is important to tell students to remember their number. For example, if the teacher wants three groups, the first student counts one, the next student says two, the next say three, and the next student starts over at one, and so on. When all students have counted, tell all the number ones to meet together, all the number twos, and then all the number threes. This strategy enables time-efficient grouping and reinforces conceptual number use.
Fishbowl	Students gather around a teacher or group of students who are modeling something new. The students observe carefully as if they are watching fish in a bowl. This strategy promotes the full attention of students even when individual students are not actively participating in the demonstration.

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Four Corners	Each of the four corners of the room corresponds to a possible opinion about a thought-provoking statement. The teacher may post a picture or a prompt in each corner of the room to represent the opinions/statements. Students walk to the corner that interests them or expresses their opinion to group with other like-minded students. This strategy allows students to express opinions and to prepare justifications with others who agree before presenting to the class.
Gallery Walk	As if in a museum, students walk past displays and respond to questions or prompts about the display. This strategy can be used in multiple ways, including to consider ideas posted on chart paper around the room or to view classmates' final products. This strategy encourages diversity of thought. When used at the end of a project, this strategy allows students to celebrate and take pride in their work while also honoring and responding to others' work.
Hands Up	The teacher holds a hand in the air to signal that students should stop what they are doing, stop talking, and look up at the teacher. When students notice the teacher's hand up, they also raise a hand to signal to classmates. This strategy is used as an attention-getting signal.
Hands Up, Pair Up	Students stand and walk around the room quietly with one hand raised in the air. The teacher says, "Stop—Pair Up." Students clap hands and stand together with a nearby student. Anyone with a hand still up needs as a partner. Students can easily find each other and pair up.
I Do, We Do, You Do	I Do: Teacher demonstrates or models an action to take place, such as reading a passage to the students. We Do: Students repeat the action with the teacher, such as re-reading a passage in unison. You Do: Student practices the learned action without the guidance of the teacher. This strategy supports students by modeling an expectation, allowing for low-pressure practice, then providing opportunities for independent practice.
I See Very Clearly	The teacher tells students he/she sees something. Students guess what it is as the teacher gives students clues. Students use observation and listening skills to guess the correct object. This strategy emphasizes the use and identification of object properties and characteristics.
Imagine That	The teacher describes a person, animal, plant, or situation for students to act out. Students imagine that they are the living thing or are in the situation and act out what happens. This can also be done in groups with a student, or rotating students, acting as the leader. This strategy promotes imagination and long-term memory. (See also: Charades to add a guessing element.)
Jigsaw	Students are divided into small “home” groups (for example, groups A, B, C, D, and E). The teacher provides different instruction (or instructional materials) to each “home” group so that each group becomes the “expert” in their unique skill or strategy. For example, there is a group of A experts, B experts, C experts, and so on. The teacher then carefully regroups students so that each new small group has at least one member of each “home” group. For example, each new group will now have one A, one B, one C, and so on. Student experts teach each other what they have learned. This strategy helps students develop ownership of their own learning, confirm their understanding, and build confidence in their mathematical abilities.
Lean and Whisper	Students lean one shoulder in toward one neighbor to answer a question that has a one- or two-word (or short) answer. This strategy engages all students in answering a question without disrupting the flow of the classroom.

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Model	The teacher or student demonstrates exactly how to complete a task. The rest of the class can ask questions before repeating what was demonstrated. This strategy allows the teacher to review any safety concerns or difficult aspects of a task, as well as share advice for task completion. This method should not be used for some inquiry activities, as it could over-influence the direction of student thinking.
Number Sign	The teacher can check for understanding quickly by asking a question and giving students a choice of answers. Students hold up one, two, or three fingers in response to the question asked. The teacher quickly scans the fingers raised to get a sense of how many students are tracking the material.
Numbered Heads Together	This is a cooperative strategy that holds each member of a group accountable for learning/ discussing material. Each student in the group is given a number. The teacher poses a question to the group. Students put their heads together to discuss the answer. The teacher then calls a number to identify a "spokesperson" to share the group's answer.
On the Fence	Each of the two sides of the room corresponds to a possible opinion about a thought-provoking statement. The teacher may post a picture or a prompt on each side of the room to represent the opinions/statements. Students walk to the side that interests them or expresses their opinion to group with other like-minded students. Students may also stay "on the fence" in the middle of the room if they are undecided. Students debate their opinion with evidence to persuade others in the room to agree with them. As students change their minds, they move to the corresponding area in the room.
One Stay One Stray	After working with partners, one person stays with the work product to present to other students while the second partner walks around and listens to peers in the class share. Then the two students switch roles. Using the strategy, both partners get to share their project and listen to others share.
Pass the Pen	Students work collaboratively in a group with one pen or pencil per group. The teacher poses a question or topic to groups. One student writes down an idea or answer, then passes the pen to the next group member. The pen continues to be passed around, allowing all students an opportunity to write at least once or twice. The strategy is used to brainstorm or activate prior knowledge on a topic and is helpful for encouraging all students to participate and share ideas.
Popcorn	Call on one student to answer a question. After the student has answered the question, they say "popcorn" and say the name of another student. It is now the turn of that student to answer the question, then pick a new student, and so on. If a student has responded, they should not be called upon a second time during the same Popcorn activity.
Relay Race	Divide the class into teams and have them line up single file. Call one student from each team to the front of the class. Ask students a question and the first to answer receives a point for their team. After answering, the student goes to the end of the line and the next student goes to the front of the room. A variation for math problems is for students to complete only one part of a math problem at a time.
Shake It Share It High Five	Students move around the classroom until the teacher signals to stop. Students then partner with a nearby student. Partners shake hands, share ideas or work products, then high five before moving around again to find a new partner. This strategy gets students out of their seats and moving, while also allowing them to share with classmates they do not sit near.
Shoulder Partners	Students lean and talk quietly with the person sitting next to them. Shoulder Partner can be used literally to just talk to the people sitting on either side, or it can be used for slightly larger groups of three or four with everyone's shoulders "touching." (This promotes the ability to speak softly—in sort of a huddle).

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Snowball Fight	Students respond to a prompt using a half sheet of paper. The student crumples the paper up like a snowball and tosses it across the room. Students pick up a snowball that lands close to them, add their comment or answer, and crumple to toss again. Repeat as needed. The strategy encourages students to interact with the ideas of students who do not sit nearby in an anonymous manner.
Think Aloud	The teacher models a process of thinking by speaking aloud what is thought. As an example, "I think I need more color here in my drawing." This strategy models for students the type of thinking they can use in an upcoming activity.
Think Time	Teacher allows a distinct period of silence so that students can process tasks, feelings, and responses. Allow students 15 to 30 seconds to think to themselves before calling on anyone to provide an answer to the class. This strategy is particularly helpful for shy or quiet students, as well as students who prefer to process content individually before contributing to a classroom or group conversation.
Thumbs Up	The teacher can quickly check for understanding using this strategy. Students hold thumbs up for agreement and thumbs down for disagreement to a question asked by the teacher. Thumbs up can also be used as a way for students to signal to a teacher that they are ready for an instruction. Thumbs down should never be used to denote disagreement with a student's answer or idea.
Turn and Talk	Students turn "knee to knee" and "eye to eye" with a Shoulder Partner to discuss answers to long-form questions. This strategy allows students to discuss ideas, reflect on learning, and check each other's answers.
Venn Diagram	Teacher draws two or more large overlapping circles as a graphic organizer to show what is the same and different about multiple topics. Teacher notes similarities in the overlapping section of the circles, then summarizes differences in the respective parts of the circles that do not overlap. This strategy allows students to visually see and record similarities and differences.
Wait Time	Similar to the Think Time strategy, the teacher waits at least seven seconds after asking a question to the whole class or after calling on a student to respond. This provides time for students to think independently before an answer is given out loud.
Whisper	The teacher can provide whole class verbal processing time by allowing students to respond to a question by whispering the answer into their hands. This strategy prompts every student to attempt an answer, with no social-emotional recourse if their answer is wrong.
Zoo Can	Similar to Calling Sticks, the teacher pulls a name stick from the can and the students must count backward while acting like an animal. This can be used for relevant content instruction or as a quick break when students need to move and laugh before finishing a task or moving on to a new task.

Formative Assessment

What is formative assessment?

The term assessment often brings to mind exams. Exams can be effective at summarizing learning at the end of a chapter, unit, instructional period or school year. After a student learns material for a certain amount of time, an exam measures how much the student has learned, retained, and can apply. **Formative assessment** encompasses strategies used in the classroom to find out if and how much students are learning along the way, so that instruction can be adjusted.

Why embed formative assessment in instruction?

Formative assessment is a tool that supports responsive teaching. Embedding formative assessment provides instructors with evidence about how much students are learning, retaining, and applying. A teacher who frequently seeks and receives feedback about how much progress students are making toward learning goals can adjust instruction to respond to misconceptions, misunderstandings, and gaps in students' ability to apply learning.

How does embedding formative assessment improve learning?

The following table (Wiliam, 2011) provides an overview of five strategies that instructors, peers, and students can use to give and receive evidence of learning throughout the learning process.

	WHERE THE LEARNING IS GOING	WHERE THE LEARNER IS RIGHT NOW	HOW TO GET THERE
TEACHER	Clarifying, sharing, and understanding what we intend for students to learn and the criteria for success	Eliciting evidence of learning	Providing feedback that moves learning forward
PEERS		Activating learners as instructional resources for one another	
LEARNER		Activating learners as owners of their own learning	

Wiliam, Dylan. Embedded Formative Assessment. Bloomington: Solution Tree Press, 2011.

The first essential step is to identify (and share with students) the desired learning outcomes, or "where the learning is going." Once learning goals are established, teachers, peers, and students themselves can check in on "where the learner is right now," or how much progress is being made toward the goals. Rather than assessing whether or not a student has sufficiently learned content after the fact, formative assessment practices provide feedback so that teaching and learning ("how to get there") can be adjusted to better obtain the agreed-upon goals.

What does embedding formative assessment look like in the classroom?

Formative assessment often occurs through classroom discussions and tasks that ask students to explain and justify their thinking. If individual students struggle to understand or apply a concept, a teacher can differentiate instruction or provide peer support to meet that students' needs. Instructors can also gather information about student learning during instruction. For example, by walking around the classroom and checking students' work as they practice new learning on Apply pages in their Mathematics Student Book, teachers can learn a great deal very quickly about students' understanding and misconceptions. When many students exhibit evidence of misunderstanding or gaps in knowledge or skills, a teacher can decide to review, reteach, or present a new approach to achieving the learning goals.

Computational Thinking

What is computational thinking?
At its core, computational thinking is a way of solving problems. When we break down problems in a way that considers how computer power could help solve them, we are thinking computationally. It is the basis for developing computer programs and applications, but it is also helpful for solving problems in any context or field. Computational thinking is introduced to students in Primary 2 through five related skills.

What skills are involved?
Decomposition
- Decomposition is the process of breaking down a complex problem into smaller, more manageable parts.
- Young students are introduced to this skill by learning to break down numbers into their place value components, then move on to breaking down simple problems, such as identifying the steps needed to solve a story problem. Students think about what they know, consider what they are trying to find out, and determine a process for solving the problem.

Pattern Recognition
- Pattern recognition involves observing and identifying patterns and trends in experiments, information, and data.
- Young students begin by observing patterns in numbers and shapes and by looking for similar patterns in the world around them.

Abstraction
- Once patterns have been recognized, abstraction involves identifying the broad or more general principles that explain and generate the patterns.
- Young students can identify repeated sequences or patterns in data, instructions, or computation, and can consider how to more efficiently express the pattern. This is often referred to as a "loop," and, specifically in mathematics, will help students make the cognitive leap from simple concepts to more complex ones. For example, in Primary 3, students begin to use their understanding of number patterns (odd and even numbers, arrays, skip counting, and so on) to extend their thinking and apply their learning to new situations. Students work with arrays to build an understanding of repeated addition, which they later connect to a more efficient process—multiplication. Working to build these connections helps students deepen and strengthen their understanding of mathematical concepts and the role of mathematics in their lives.

Algorithm Design
- Designing an algorithm begins with articulating step-by-step instructions for how to solve similar problems over and over again.
- Young students practice this skill in recognizing that the same steps can be taken to solve similar problems with different details. For example, consider the process of learning the algorithm for adding with regrouping. For younger students, this process requires multiple and varied experiences working with concrete materials, such as Base Ten manipulatives. Once students are confident in their use of concrete materials and fully grasp the steps involved in physically regrouping Ones or Tens (or both) to solve an addition problem, the instructor can help them transition to a more efficient process—solving the same problems on paper.

Testing and Refining
- Testing and refining are essential to students increasing ownership of their own learning. The use of patterns, abstractions, and algorithms presents frequent opportunities to test and refine methods for accuracy and efficiency.
- Young students begin by identifying their own errors as the first step in this essential skill. Rather than assigning a grade after one attempt to answer a set of mathematics questions, Primary 3 students are often asked to compare their answer to a set of correct answers (or to a partner's answers) and to identify what errors were made if their answer is incorrect.

Why is computational thinking important?
Utilizing the power of computers is an essential part of solving the grand challenges our world faces, as well as many of the problems we face in our local communities both today and in the future. Our students need to learn computational thinking skills so that they can leverage the power of today's and tomorrow's computers in solving problems. Computational thinking skills will also give our students another way to approach solving problems and will build confidence and creativity.

How is computational thinking integrated into Primary 3 instruction?
For Primary 3, computational thinking applications are embedded in some Connect, Learn, and Reflect segments. Additional optional opportunities for extending and deepening learning experiences are highlighted throughout the Teacher Guide. When a lesson presents an opportunity to introduce or practice a computational thinking skill, a Note to the Teacher suggests how to integrate or emphasize computational thinking skills.

Primary 3 Term 1 Mathematics Scope and Sequence

PRIMARY 3	THEME 1	THEME 2
A. COUNTING AND CARDINALITY		
Instruction of Counting and Cardinality is completed by the end of Primary 1.		
B. OPERATIONS AND ALGEBRAIC THINKING		
1. Represent and solve problems involving multiplication and division.	**X**	**X**
a. Explain products of whole numbers. 1) For example, describe or represent 2 × 3 as the total number of objects in 2 groups of 3 objects each.	X	X
b. Explain quotients of whole numbers. 1) For example, describe or represent 24 ÷ 4 as the number of objects in each share when 24 objects are divided equally into 4 shares 2) For example, describe or represent 24 ÷ 4 as a number of shares when 24 objects are partitioned into equal shares of 4 objects each. 3) For example, describe a context in which a number of shares or a number of groups can be expressed as 24 ÷ 4.	X	X
c. Multiply and divide within 100.	X	X
d. Use strategies to solve problems multiplication and division problems, including: 1) Manipulatives 2) Drawings 3) Arrays 4) The relationship between multiplication and division	X	X
2. Understand properties of multiplication and the relationship between multiplication and division. Solve problems involving the four operations.	**X**	**X**
a. Apply properties of operations as strategies to multiply and divide, including: 1) Commutative Property of Multiplication If 4 × 3 = 12 is known, then 3 × 4 = 12 is also known. 2) Associative Property of Multiplication The problem 5 × 2 × 4 can be solved by multiplying any two of the numbers, then multiplying the product by the third number. 3) Distributive Property of Multiplication The problem 8 × 6 can be solved as 8 × 4 + 8 × 2. The problem 3 × (4 + 2) can be solved as 3 × 4 + 3 × 2.	X	X
b. Apply the relationship between multiplication and division to solve multiplication and division problems with one unknown.	X	X
c. Solve two-step story problems involving addition, subtraction, multiplication, or division.	X	X
d. Use mental computation and estimation strategies (including rounding to the nearest 1,000) to assess the reasonableness of answers.	X	X

PRIMARY 3	THEME 1	THEME 2
C. NUMBERS AND OPERATIONS IN BASE TEN		
1. Work with numbers to gain foundations for place value.	**X**	**X**
a. Read and write numbers to 100,000 using numerals and expanded form.	X	X
a. Order a set of up to five numbers with values up to 100,000 from least to greatest or greatest to least.	X	X
c. Identify arithmetic patterns, including those in addition and multiplication fact families.	X	X
2. Use place value understanding and properties of operations to add and subtract multi-digit numbers.		**X**
a. Add and subtract two numbers up to four digits using a variety of strategies, such as: 1) Place value concepts and regrouping. 2) Properties of operations. 3) Relationship between addition and subtraction.		X
b. Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 (for example, 3 × 50, 6 × 30) using strategies based on place value and properties of operations.		X
D. MEASUREMENT AND DATA		
1. Measure and estimate length and mass in metric units. Estimate and read volume in metric units.	**X**	**X**
a. Select appropriate tools and measure objects in millimeters, centimeters, or meters. 1) Estimate and measure lengths using millimeters, centimeters, and meters. 2) Use place value concepts to convert between millimeters and centimeters and centimeters and meters.	X	X
b. Select appropriate tools and measure objects in grams and kilograms. 1) Estimate and measure masses of objects in grams and kilograms. 2) Use place value concepts to convert between grams and kilograms.	X	X
c. Read volume measurements in milliliters and liters from standard labeled containers.		X
d. Estimate volume measurements in milliliters and liters.		X
e. Demonstrate understanding of the relationship between milliliters and liters`		X
2. Solve problems involving measurement and estimation of length, mass, and time.	**X**	
a. Solve one- and two-step story problems involving length, mass, and time.	X	X
3. Work with time and money.	**X**	
a. Tell and write exact time from analog and digital clocks.	X	X
4. Represent and interpret data.	**X**	
a. Collect, organize, and represent numerical data on a line plot.	X	X
b. Solve story problems and analyze data displayed on a line plot. *Note: Students may continue to analyze data from bar graphs and pictographs.*	X	X

PRIMARY 3	THEME 1	THEME 2
5. Understand concepts of area and relate area to multiplication and to addition. Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.		**X**
a. Identify area as an attribute of plane figures.		X
b. Use nonstandard measurements to calculate the area of a figure (in whole numbers).		X
c. Apply concepts of area measurement: 1) A square with side length 1 unit is said to have "one square unit" of area. This unit can be used to measure area.		X
d. Measure areas (in whole numbers) by counting unit squares.		X
f. Solve real-world and mathematical problems involving perimeters of polygons, including: 1) Finding the perimeter given the side lengths. 2) Drawing rectangles on a grid with the same perimeter and different areas or with the same area and different perimeters.		X
E. GEOMETRY		
1. Identify and describe shapes; reason with shapes and their attributes.		**X**
a. Identify rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.		X
b. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. 1) For example, partition a shape into 4 parts with equal area and describe the area of each part as 1/4 of the area of the shape.		X

Lesson Preparation Template for Education 2.0

Grade (P3)Class: ________ Date: ________ Present: ________ Absent: ________ Students' total number: ________

Content / Windows	Theme	Chapter	Lesson	Learning Objectives	Activities	Teacher's Choices						
						Teacher guide Pages	Teaching strategies	Questions/ Modeling	Digital esources	Differentiation / Challenges	Maths Journal	Enrichment

Teacher's Self Reflection: ☐ Exceeds expectations ☐ Meets expectation ☐ Sometimes Meets Expectation ☐ Below Expectations ☐

Grade (P3)Class: ________ Date: ________ Present: ________ Absent: ________ Students' total number: ________

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Teacher's Self Reflection: ☐ Exceeds expectations ☐ Meets expectation ☐ Sometimes Meets Expectation ☐ Below Expectations ☐

PRIMARY 3

Mathematics

WHO AM I?

LIVING HEALTHY

Chapter 1

Lessons 1 to 10

Chapter 1: Lessons 1 to 10

Chapter Overview:

In this first chapter of Primary 3 Mathematics, students begin by learning the routines of the math period. Each lesson begins with Connect. During Connect, students review Primary 2 or Primary 3 skills and concepts and/or are introduced to a problem that helps set a purpose for the Learn section of the period. Each class ends with a Reflect time, during which students write or discuss their learning and make connections to prior learning. (See the front of this guide for detailed information about each component of the math lesson.)

In Lessons 1 through 10, students start with familiar concepts from Primary 2 and begin to add new and more complex skills. They review bar graphs and pictographs and are introduced to line plots. Then they review measurement of length with centimeters and meters and add the millimeter. They begin to think about how the millimeter, centimeter, and meter are related to each other. Students practice measuring and use that skill to create line plots based on measurement data. They analyze the results and answer questions about the data.

Throughout the year, students will be introduced to mathematical practices that will enable them to think, model, and solve problems like a mathematician. Throughout this guide, these practices are referred to as "Thinking Like a Mathematician." (See the Thinking Like a Mathematician section at the front of this guide for detailed information about the mathematical practices.) The first lesson of the year introduces this anchor chart as students solve a challenging pattern problem and discuss the standard of **perseverance** when the work gets challenging.

A Note about Instruction in Primary 3 Mathematics:

This year of math instruction focuses on helping students build deep conceptual math understanding around multiplication, division, and fractions. These big concepts are woven throughout the year as students dive into exploring what multiplication and division mean and how they relate to each other and to addition and subtraction. Students also investigate and work with fractions. This will look messy at times as students use materials and work together to develop deep mathematical understanding. Long before a student writes a multiplication fact or practices their facts, they will establish a foundation for learning by exploring what “equal groups” means using a variety of concrete and abstract strategies to solve problems and linking repeated addition to the understanding of multiplication and division.

You will engage students in many discussions, and exploration will lend itself to a deep understanding of the concepts. This can be difficult for a teacher at times. It can be tempting to just tell students the answers or show them a problem-solving strategy or an algorithm. However, it is very important that you provide opportunities for them to explore and struggle, asking helpful, guiding questions as they explore more difficult mathematical skills and concepts independently, in pairs, in small groups, and as a whole group. You may sometimes feel as though you are not teaching, but observing, questioning, and facilitating learning. These are rich learning experiences during which students build meaning and understanding for themselves and each other. This is what young mathematicians need to build skills and confidence in these concepts.

Chapter 1: Lessons 1 to 10

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from their peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 1 to 10, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.b. Order a set of up to 5 numbers with values up to 100,000 from least to greatest or greatest to least.
1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

D. MEASUREMENT AND DATA:

1.a. Select appropriate tools and measure objects in millimeters, centimeters, and meters.
4.a. Collect, organize, and represent numerical data on a line plot.
4.b. Solve story problems and analyze data displayed on a line plot.

Computational Thinking

Throughout Lessons 1 to 10, students will work toward the following learning indicators:

D. MEASUREMENT AND DATA:

4.b. Solve story problems and analyze data displayed on a line plot.

CH 1 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
1	Students will: • Learn the routines of the daily math block. • Identify repeating and arithmetic patterns. • Determine the next two elements in a pattern.
2	Students will: • Identify elements of a bar graph. • Organize, represent, and analyze data from a bar graph.
3	Students will: • Identify the elements of a pictograph. • Explain the meaning of scale in a pictograph. • Create a pictograph from a data table. • Determine an appropriate graphing question.
4	Students will: • Identify the elements of a line plot. • Collect and record data. • Create a line plot.
5	Students will: • Discuss centimeter measurement. • Measure the length of objects in centimeters.
6	Students will: • Estimate the length of objects in centimeters and meters. • Discuss meter measurement. • Demonstrate understanding of the relationship between centimeters and meters. • Determine whether to use centimeters or meters to measure length.
7	Students will: • Measure the length of objects in centimeters. • Use measurement data to create a class line plot.
8	Students will: • Demonstrate understanding that centimeters are composed of millimeters. • Determine whether to use centimeters or meters to measure length. • Measure the length of objects in millimeters. • Describe the pattern they observe when measuring the same object in millimeters and centimeters.
9	Students will: • Use a table to record data. • Measure the length of objects. • Determine whether to use millimeters, centimeters, or meters to measure length.

LESSON	INSTRUCTIONAL FOCUS
10	Students will: • Create a line plot using their collected data. • Evaluate their personal progress using a checklist. • Explain how they will use their new learning in their daily lives.

Term/Theme Preparation for the Teacher

Note to the Teacher: The following items will be used daily in some form throughout the theme. Careful preparation of them in advance is necessary for successful implementation of daily lessons.

- Create **Calling Sticks**: Write the name of each student on a wooden stick. Store them in a cup or jar.
- Create an anchor chart titled Thinking Like a Mathematician, where you will add math practices throughout the theme.

Chapter Preparation for Teacher

Note to the Teacher: This chapter begins with a review of bar graphs and pictographs. You will need to make a large bar graph and a large pictograph that show the months of your students' birthdays. Be sure to collect that data on the first day (or before school starts) so that you can create these graphs. Additionally, you will create some anchor charts that will hang in your classroom all year. Anchor charts are tools that give students a visual reference and reminder about ideas, mathematical concepts, and procedures. They are working documents and are added to over time as lessons and the year progress. In this chapter, introduce the anchor chart titled Thinking Like a Mathematician, where you will add math practices. You will also make an anchor chart for Measurement in Lesson 5, which you will add to as new units of length are introduced.

For Lesson 1:
- Collect 50 counters for each partner group or group of four and place in cups or bags.
- Make a large anchor chart titled Thinking Like a Mathematician. This will stay displayed in the classroom and have items added to it throughout Primary 3.

For Lesson 2:
- Collect data about your students' birthday months before the school year starts or on the first day of school.
- Create a bar graph that represents birthdays in your class. Use a scale of 2 (the space between each line on the bar graph should be worth 2 students).

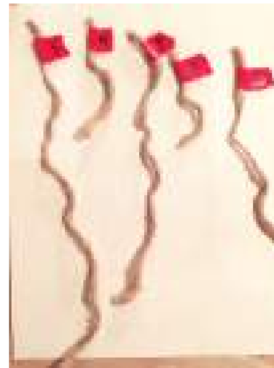
For Lesson 3:
- Gather construction paper (one sheet per pair of students).
- Create a pictograph using the birthday month data. Each image should represent 2 students.
  - Make the image something simple that can be cut in half if necessary, like a cake or a candle or a stick figure that only has one-half shown.

For Lesson 4:
- Make bags of beans (or other small items) for students to count (one set for each pair of students). Be sure to create the following:
  - 2 bags with 53 beans.
  - 3 bags with 57 beans.
  - 5 bags with 60 beans.

- 1 bag with 51 beans.
- 1 bag with 62 beans.
- Bags with 51 to 62 beans (all remaining bags).

For Lesson 5

- Gather centimeter rulers (or have students cut out the centimeter rulers in the Student Resources section of their student books). Make sets of five pieces of string that are all different centimeter lengths (one set per group of four students).
    - Each set must be the identical in the number, size, and labeling of strings.
    - Each piece needs to be an exact centimeter length (no halves, thirds, and so on).
    - No piece should be more than 30 cm.
    - Use tape to number each piece of string. They should not be numbered in order of length. Remember that each set of strings should be exactly the same so students can compare their measurements.
    - Save the sets of string to be used again in Lesson 8.
    - Example:



- Create an anchor chart for Measurement. You will add to the chart throughout the year as a reference for units of measure. An example is shown below.

Measurement			
Units Of Measurement	Compared To Other Units	Body Benchmark	Things About That Size

For Lesson 6

- Gather classroom objects of varying sizes to use to estimate measurement in centimeters. Examples include erasers, pencils, books, pens, or coins.
- Add the word "meter" to Measurement anchor chart under Units of Measurement, and that a meter is made up of 100 centimeters. Also add body benchmark of "nose to thumb on outstretched adult arm."

For Lesson 7

- Prepare sets of classroom materials that can be measured in centimeters. You will need one set for each group of four students.
    - The sets should have five to eight objects in them and be identical in length. For example, each set would contain one pencil that is the same in all sets, one marker that is the same in all sets, and so on.
    - Ensure all items measure exactly to the centimeter and that some items are the same length as others.
- Designate a place on the board to draw a line plot (or display a large piece of paper). Draw a blank number line with the number of hashmarks students will need to display their measurement data on a line plot. An example is shown below.

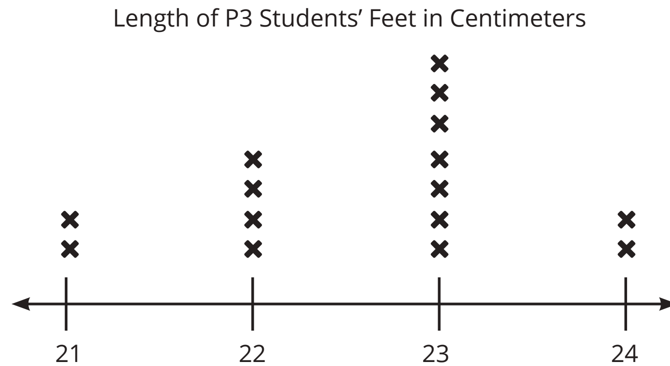


For Lesson 8:

- Gather rulers that show centimeters and millimeters (or have students cut out the centimeter/millimeter ruler at the back of their student book).
- Collect or draw images to be sorted into “measure in meters” or “measure in centimeters.” These could be images from the newspaper, photos, or hand drawn. They could include things like buildings, trees, doors, people, buses, bikes (to be measured in meters); and ice cream cones, figs, books, cats (to be measured in centimeters).
- Have available the string sets from Lesson 5.

For Lesson 9:

- Prepare a large copy of the Length of P3 Students’ Feet in Centimeters line plot shown below.

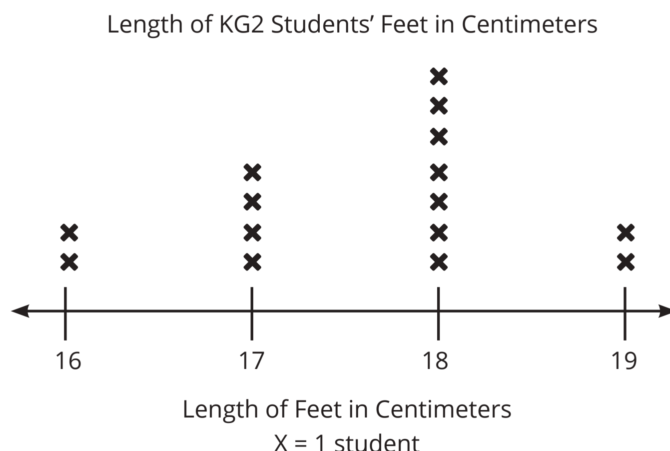


- Prepare sets of objects for students to measure in millimeters and centimeters (one set per group of four students).
  - Each group should receive the same number of items to measure.
  - Each group should receive a different set of objects.
  - Each group should receive a set of objects that contains several examples of the same item. For example, one group’s set may contain eight pencils of different lengths. Another group’s set may contain eight crayons of different lengths. A third group’s set may contain different types of markers with different lengths, and so on.
  - Some of the sets of objects may be similar (all pencils, for example), but the objects should not have the exact measurements as another group’s items.
- Create a table for demonstrating how to gather data. This can either be on the board or a large sheet of paper. See below for example.

Name of object	Length (cm or mm)

For Lesson 10:

Create a large copy of the Length of KG2 Students’ Feet in Centimeters line plot.

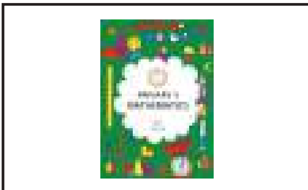
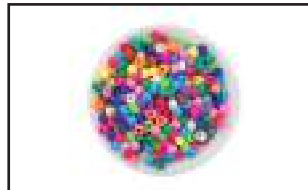


- Write the checklist from the Mathematics Student Book (below) on the board.

Checklist for Line Plot Assessment Lesson 10

☐ I gave my line plot a title.
☐ I labeled the number line.
☐ I wrote the units of measurement.
☐ My work is neat and organized.

Materials Used

Student book	Pencil	Counters (beans, cubes,)	Scissors
			
String	Colored markers	Crayons	Construction paper
			
Bags of beans	Centimeter ruler	Anchor chart	Birthday bar graph
			
Meter stick	Line plots	Pictograph birthday months	

Lesson 1 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, the teacher sets the stage for a year of math learning, introducing routines, materials, and expectations in Connect. During the Learn section, students work with a partner to solve a variety of pattern problems.	Students will: • Learn the routines of the daily math period. • Identify repeating and arithmetic patterns. • Determine the next two elements in a pattern.	• Elements • Increase • Number pattern • Pattern • Persevere • Visual pattern

LESSON PREPARATION FOR THE TEACHER

- Collect 50 counters for each partner group or group of four.
- Make a large anchor chart titled Thinking Like a Mathematician.

MATERIALS

- Counters—50 for each group
- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: On the board, write the words “Connect,” “Learn,” and “Reflect.”

TEACHER SAY: **Today is a great day. It is the first day of math class for the year. This year, we will learn about multiplication and division, fractions, measurement, and so much more. We will have many opportunities to work together and to discuss what we are learning. In our first few math classes, we will review some concepts from last year and get to know each other. We will follow a different schedule, though. Instead of beginning with Calendar, we will start with a short activity called Connect.**

TEACHER DO: Point out the words on the board for the students as each section is described.

TEACHER SAY: **Connect is a time to review skills from last year or introduce a problem that we will explore more during the Learn section. You will work with partners, in small groups, and on your own. You will use a Mathematics Student Book again to record your work and to practice your math skills.**

To start, think for a moment about one thing you remember from last year that you enjoyed. It could be a concept such as adding or subtracting numbers, shapes, measurement, or a part of math class such as Calendar. Give me a Thumbs Up when you are ready. I will use Calling Sticks to hear from some of you.



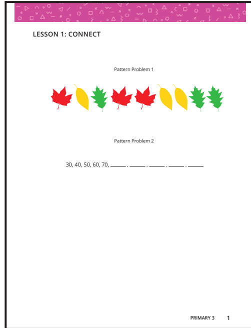
STUDENTS DO: Think for a moment about a math activity or concept from last year. When ready, give a **Thumbs Up**. Selected students share with the group.

TEACHER SAY: **Thanks. It is good to hear what you remember and enjoyed. This year, we will learn new concepts and do interesting projects. Let’s get started.**



Learn (35 to 45 minutes)

Directions


LESSON 1: CONNECT

Pattern Problem 1

Pattern Problem 2

30, 40, 50, 60, 70, ____, ____, ____, ____, ____

PRIMARY 3 1

1.TEACHER DO: Display the Thinking Like a Mathematician anchor chart.

TEACHER SAY: Today we will explore some patterns. Last year, you looked at patterns too, so you have some experience with them. Open your Mathematics Student Book to page Lesson 1: Connect.

 **STUDENTS DO:** Open student books to page Lesson 1: Connect.

TEACHER SAY: Look at Pattern Problem 1. Then turn to your Shoulder Partner and decide what the pattern is and what would come next in this pattern. I will use Calling Sticks to choose someone to explain the pattern. You might find more than one pattern, and that is okay.

 **STUDENTS DO: Turn and Talk** to **Shoulder Partner** about the pattern. Selected students share. Students may see just the color or the number or both.

TEACHER SAY: Nice job. This is a visual pattern. It has one red leaf, then one yellow leaf, then one green leaf, and then it has two red leaves, two yellow leaves, and two green leaves. It is a color pattern that repeats and a number pattern as well that seems to be increasing, or getting larger. Whisper into your hand what the next image would be. Give a Thumbs Up if you would like to share with the group.

 **STUDENTS DO: Whisper** the next element in the pattern. Give a **Thumbs Up** if want to share.

TEACHER DO: Call on a student with **Thumbs Up** to share the next element. Repeat until the next three elements have been shared.

TEACHER SAY: Good job. This visual pattern repeated colors, and the number of leaves increased one each section. Let's look at Pattern Problem 2.

 **STUDENTS DO:** Examine Problem Pattern 2.

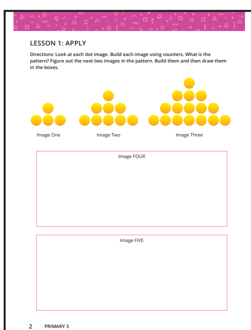
TEACHER SAY: This pattern does not have pictures. It is a number pattern. It has five numbers listed—30, 40, 50, 60, and 70. Lean and Whisper what you think the pattern is to your Shoulder Partner.

 **STUDENTS DO: Lean and Whisper** to **Shoulder Partner**.

TEACHER SAY: Nice job. I heard students saying the pattern was counting by 10s or adding 10 each time. Let's continue this pattern. I will use the Calling Sticks to choose a student to say the next number, and then I will choose another student for the next number, until we have added the next five numbers to this pattern.

TEACHER DO: Use **Calling Sticks** to choose five students. Record the numbers as they say them on the board, continuing the pattern. If students struggle to identify the next number, ask them to try a strategy that could include looking at the first digit or calling on a friend to help.

 **STUDENTS DO:** Record numbers in books as selected students answer.


LESSON 1: APPLY

Directions: Look at each dot image. Build each image using counters. What is the pattern? Figure out the next two images in the pattern. Build them and then draw them in the boxes.

Image One Image Two Image Three

Image FOUR

Image FIVE

2 PRIMARY 3

TEACHER SAY: Good work. We looked at a visual pattern and then we looked at a number pattern. Turn to page Lesson 1: Apply. You will see another pattern, but this one is made up of dots.

 **STUDENTS DO:** Turn to page Lesson 1: Apply.

TEACHER SAY: This is a pattern problem that many mathematicians have worked on. You will work with your Shoulder Partner to see if you can identify and continue the pattern. To do that, I will give you counters to build each image of dots. Building it may help you see what is happening in this pattern.

Once you think you and your Shoulder Partner understand what the next image of dots would look like, build it with the counters and then record it in your book. Try to build and draw the next two images of dots—the next two images in the pattern. There is also a challenge question for you to think about, so if you finish early, you can work with your Shoulder Partner on the challenge.

TEACHER DO: Give each group of **Shoulder Partners** a cup or bag of counters. If you have a large class, two groups of **Shoulder Partners** can work together.



STUDENTS DO: Work together to identify the pattern and build the next two images in the pattern. Record answers in student book.

TEACHER DO: Observe students building the dot images and working to identify the next two images in the pattern. When the Learn time is over, use an **Attention Getting Signal** to bring the group back. If time permits, ask students to share solutions and strategies.



STUDENTS DO: Share solutions and strategies.



Reflect (5 to 10 minutes)

Directions

1.TEACHER SAY: At the end of each math class, we have a few minutes to share. Sometimes you will reflect and share with a partner or with the whole group. Sometimes you will use the Math Journal pages in your student books to record your thoughts, ideas, and new learning.

Today we solved some pattern problems. We had a visual pattern of leaves, a number pattern, and a dot pattern. Whisper into your hand which pattern was the hardest to solve. Then turn to your Shoulder Partner and share which one and why.



STUDENTS DO: Whisper into hand which was the most challenging pattern. Then **Turn and Talk** to **Shoulder Partner**.

TEACHER DO: Wait 1 to 2 minutes for students to **Whisper** and share with **Shoulder Partner**.

2.TEACHER SAY: Today I saw many of you get frustrated or confused, but you kept trying to figure out the answer. This year in math, we will work hard to solve all sorts of problems, easy ones and hard ones. When we have a hard one, sometimes we have to really stick with it and try a lot of different strategies, such as talking to a partner or building or drawing a representation of the problem. Sticking with a problem is called PERSEVERING. It is about not giving up. This is what we want to try and do when a challenging problem comes our way.

To remind us of this, we have a new chart that will hang in our class called Thinking Like a Mathematician. As we continue to get to know each other and work together, we can add ideas to remind us what it means to Think Like a Mathematician. Our first word or idea will be that mathematicians persevere.

TEACHER DO: On the class chart, write "Mathematicians persevere when solving problems. They try lots of different strategies and do not give up."

TEACHER SAY: Great first day of math. In our next math class, we will learn more about each other and review some types of graphs that we made in P2.

Lesson 2 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students review bar graphs and then use data about the number of siblings to create their own bar graph.	Students will: • Identify elements of a bar graph. • Organize, represent, and analyze data from a bar graph.	• Axis • Bar graph • Horizontal • Scale • Tally marks • Vertical

LESSON PREPARATION FOR THE TEACHER

Create birthday bar graph. See details in Chapter Preparation for Lesson 2.

MATERIALS

- Teacher-created birthday bar graph with a scale of 2
- Colored markers or crayons
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: In Primary 2, students worked with bar graphs and pictographs, so this lesson should be mostly review. Students had experience with scales of 2, 5, and 10 as well as with bar graphs that were presented vertically and horizontally, but some reteaching may be necessary if they seem confused.

1.**TEACHER DO:** Post the birthday month bar graph.

TEACHER SAY: In our last math class, we looked at patterns and worked together to solve a challenging pattern problem. We will now spend time reviewing graphs and learning a new type of graph. On the board is a type of graph that we learned last year. Give me a Thumbs Up if you remember the name.

 **STUDENTS DO:** Give a **Thumbs Up** if they know the name. Selected student shares.

TEACHER SAY: This is a bar graph. In a bar graph there are two sides, a HORIZONTAL side (left to right) and a VERTICAL side (up and down). Mathematicians call these AXES. This is the vertical axis and this is the horizontal axis (point to each axis as you name them). Last year, we learned that we need to have each side labeled so others can understand our graph. One axis is labeled Number of Students and the other axis is labeled Months. Whisper into your hand what each bar on this graph represents.

 **STUDENTS DO: Whisper** answers into hands.

2.**TEACHER SAY: Each bar represents how many people have a birthday in that month. There is also a title that helps us understand what this graph is about. The vertical axis is labeled Number of Students but the numbers do not count by 1s. Instead they count by 2s. Why is that important to notice, and how does that help us analyze the graph? Turn and Talk to your Shoulder Partner. I will use Calling Sticks to choose students to share.**

TEACHER DO: Wait 1 minute and then choose one or two students to share.

 **STUDENTS DO:** Talk to partner and share thinking, if selected.

TEACHER SAY: Nice job. This graph has a scale of 2. On the vertical axis, where it says Number of Students (point to the axis), each line represents 2 students who have birthdays in a given month. It is important to notice the scale so that you can accurately read the data on the graph. Now it is your turn to make a bar graph.



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Make a chart on the board:

Number of Siblings	Number of Students
0 siblings	
1 sibling	
2 siblings	
3 siblings	
4 to 6 siblings	
More than 6 siblings	

Note to the Teacher: Tally marks were introduced in Primary 2. If students need a review, remind them that tally marks are grouped by 5 with 4 vertical lines and one diagonal line. Provide a few examples if needed.

TEACHER SAY: First, we need to collect some new data for your bar graph. Let's find out how many siblings (brothers or sisters) each of us has. I will keep track of the data on the board in a chart with tally marks. Pop up if you have no siblings.

 **STUDENTS DO:** Pop up if they have no siblings.

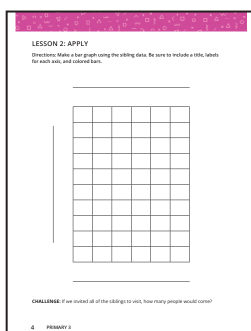
TEACHER DO: Record on chart using tally marks. Repeat the process for 1, 2, 3, 4 to 6, and more than 6 siblings.

 **STUDENTS DO:** Pop up for their number of siblings.

2.TEACHER SAY: Great, now we have data that we can use to make a bar graph. Give me a Thumbs Up if you can explain why I chose to use tally marks to keep track of my data.

 **STUDENTS DO:** Give **Thumbs Up** and share, if selected.

TEACHER SAY: Using tally marks is a quick way to keep track of data. Tally marks are recorded individually up to 4 (such as / , // , /// , ////) and then in groups of 5 so it is easy to total. Now turn to page Lesson 2: Apply in your student books.



 **STUDENTS DO:** Take out student book and turn to page Lesson 2: Apply.

3.TEACHER SAY: On this page, you will see a blank grid and lines for a title and labels. Your job is to create a bar graph using the data we collected about siblings. Remember that you will need to decide on the scale for your graph. The scale for our birthday graph was 2, but think about the numbers in this new data. You have to fit all of the data on the page, so should your scale be 1, 2, 5, or 10? It is up to you. Be sure to label and color each bar in your graph a different color and give your graph a title.


STUDENTS DO: Using the data table on the board, create a bar graph with colors and labels. If they finish early, they can work on the Challenge question.

TEACHER DO: Walk around the room observing students making their bar graphs. Offer support where needed and notice who might be struggling to make the graph. Ask students questions as they are working, such as:

- What scale did you choose? Why?
- If you made this bar graph horizontally, how would that change your labels?
- Why is this a good type of graph for this data?
- Is there a different type of graph that you might use?

When Learn time is over, bring the group back together.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Good work today reviewing bar graphs and making your own showing our class sibling data. In your student book, find page Lesson 2: Math Journal.**


STUDENTS DO: Turn to page Lesson 2: Math Journal.

TEACHER SAY: When we create graphs, it is to help us look at and understand data. One way to do that is by asking good questions. A question is good when it is both interesting and important. What is a good question to ask about a graph? How can we ask questions that help us understand the data and learn about what the data shows? Raise your hand if you have an idea.


STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER SAY: Great ideas. Look at your data and write two questions that could be answered by looking at this graph.

TEACHER DO: Give students 2 to 3 minutes to write questions in their student book. If time permits, select two or three students to share.


STUDENTS DO: Write two questions about the data in student book. Selected students share questions.

TEACHER SAY: In our next math class, we will look at the questions you wrote and talk more about what makes a good question.

TEACHER DO: Collect student books. At the end of the day, review the questions the students wrote. Select several to use for the Connect section of the next lesson.

Lesson 3 Overview

LESSON OVERVIEW

In this lesson, students look closely at crafting quality questions and then review and make a pictograph with a partner.

LESSON PREPARATION FOR THE TEACHER

- Gather construction paper (one sheet per pair of students).
- Create a birthday month pictograph. See details in Chapter Preparation for Lesson 3.

LEARNING OBJECTIVES

Students will:

- Identify the elements of a pictograph.
- Explain the meaning of scale in a pictograph.
- Create a pictograph from a data table.
- Determine an appropriate graphing question.

KEY VOCABULARY

- Key
- Pictograph

MATERIALS

- Pictograph of birthday months in the class
- Colored markers or crayons
- Construction paper—one sheet for each set of partners
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: Analyzing and interpreting data are core competencies of computational thinking. Students need to be able to collect, organize, present, and analyze findings. Drafting quality questions enables students to interpret the data in a meaningful way.

1.TEACHER DO: Choose four or five quality questions that students wrote in the last class and record them on the board. Try and find questions that allow students to analyze the data, such as questions that ask how many more or how many less. Also, write the following questions on the board:

- What color is the bar for 1 sibling?
- Why do people have so many siblings?
- Do more people have 1 sibling or 3 siblings?
- How many siblings does our entire class have?
- How many siblings does (teacher's name) have?

TEACHER SAY: In our last math class, we reviewed bar graphs and made our own. At the end of class, you wrote questions that could be answered by looking at your graphs. I wrote some of those on the board along with some others. Turn and Talk to your Shoulder Partner about which questions you think are good ones. Remember, a good question is one that helps us identify interesting and important information. Give me a Thumbs Up when you are ready. I will choose partners to share a good question and explain why they think it is a good question.



STUDENTS DO: Discuss questions with partner and give a **Thumbs Up** when ready to share.

TEACHER DO: Wait 1 to 2 minutes. When several partners show **Thumbs Up**, choose two or three partners to share.

TEACHER SAY: Nice job. I am wondering if there are any questions that we could cross off because they do not help us analyze the data in an interesting or important way. Raise your hand if you have a question you would like me to cross off the board.



STUDENTS DO: Raise hand to offer suggestions of questions that can be crossed off and explain why.

TEACHER DO: Call on two or three students to share.

TEACHER SAY: **Good work. This year when we are working with graphs and asking questions, we want to really think about questions that help us understand the data in a deeper way. "What color is the bar for 1 sibling?" does not tell us anything about the data, but _____ (insert a good question that a student crafted) does. Let's keep this in mind as we look at another type of graph.**



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Display the birthday pictograph on the board.

TEACHER SAY: **This is another type of graph that we learned about in P2. Whisper the name of this graph if you remember.**



STUDENTS DO: **Whisper** answer.

TEACHER SAY: **This is a pictograph. Instead of bars to represent the data, a pictograph uses pictures. It still has labels, but it has a KEY. Give me a Thumbs Up if you remember what the key is used for.**



STUDENTS DO: Give a **Thumbs Up** to share.

TEACHER SAY: **The key explains what each picture represents. In the pictograph, each image represents 2 students. I noticed that this pictograph has some images that are a half. What does that mean? How can I determine how many students have birthdays in _____ (pick a month that has an odd number of students and half an image)? Turn and share your thinking with your Shoulder Partner.**



STUDENTS DO: Turn and share thinking with **Shoulder Partner**.

TEACHER SAY: **The key tells us that each image is 2 students, so if we have half an image, that equals 1 student. In _____ (use the month from above), there are _____ students who have birthdays. Pictographs are good graphs to use when showing large quantities of data since you can decide what quantity each image represents.**

Today you are going to make a pictograph with a partner. I will use the Calling Sticks to choose partners. Once you have your partner, you will come and get a large piece of paper and some colors.

TEACHER DO: Use the **Calling Sticks** to choose partners.



STUDENTS DO: Meet with partners and collect materials.

LESSON 3: APPLY

FAVORITE DESSERTS	
Basbousa	||||
Kunafa	𝍸 ||||
Sweet Potatoes	|||
Sweet Feteer	𝍸 𝍸 ||
Rice Pudding	𝍸
Om Ali	𝍸 𝍸

6 PRIMARY 3

TEACHER SAY: **Open your student books to page Lesson 3: Apply. On that page, you will see a data table. The table has data that was collected last year about students' favorite desserts. Use this data to make your own pictograph. Choose what image you will use and make sure to put a key on your graph so others know what each image represents. When you are done with your graph write one good—interesting and important—question that can be answered about the data.**

TEACHER DO: Write the following steps on the board:

1. Choose an image for your pictograph.
2. Think about the data in the table and select a scale for your pictograph. How many students will each image be worth? (1, 2, 5, or 10).
3. Create your pictograph. Include a title and a key.
4. Write one good question that can be answered by your graph.

 **STUDENTS DO:** Work with a partner to create a pictograph and write one good question.

TEACHER DO: Walk around the room assisting partners who seem to be struggling. Ask students to explain their process for picking an image and the quantity that it represents. When Learn time is over, bring the group back together.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today we are going to do a Gallery Walk. Remember that during a Gallery Walk, we are quiet, put our hands behind our backs, and look carefully with our eyes. We walk slowly around the room and take our time to see all of our hard work. At the end, I will ask you if you noticed anything you would like to share out loud about each other's pictographs. You will walk around the room looking at the pictographs and ask yourself: Did they make a pictograph that is similar to mine? How is it different? What did each of their images represent? Can you answer their question? When you hear me clap three times, stop where you are.**

 **STUDENTS DO:** Walk around class looking at other students' work.

TEACHER DO: Give students 1 to 2 minutes to walk around looking at students' work and then clap three times.

 **STUDENTS DO:** Stop walking when they hear the claps.

TEACHER SAY: Give me a Thumbs Up if you would like to share with the group what you noticed.

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected students share observations.

TEACHER SAY: Great work today reviewing and creating pictographs. We can display these in our classroom, and in our next math class we will learn a brand new type of graph.

Lesson 4 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students begin to learn about line plots.	Students will: • Identify the elements of a line plot. • Collect and record data. • Create a line plot.	• Frequency • Line plot • Number line • Numerical data

LESSON PREPARATION FOR THE TEACHER	MATERIALS
Make bags of beans (or other small items) for students to count. See details in Chapter Preparation for Lesson 4.	• Bags of beans (one bag for each pair of students) • Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER SAY: **I need your help with something. This year, I created bags of beans to help us count. I made ____ (number of bags will vary based on number of student pairs). I tried to have about the same number of beans in each bag, but I am not sure exactly how many are in the bags. First, I want to know how many beans are in each bag, and then I want to have an easy way to show that information.**

Turn and Talk to your Shoulder Partner about how I could go about collecting this information, or data, and then organizing it. When you have an idea, give a Thumbs Up.



STUDENTS DO: **Turn and Talk** to **Shoulder Partner** about how to answer the question. Give a **Thumbs Up** to share and, if chosen, share idea.

TEACHER SAY: **Good ideas. I first need to collect the data by counting the beans in each bag. I will bring you and your Shoulder Partner a bag of beans. Count them and record the number on a piece of paper.**

TEACHER DO: Hand out bags to partners. Wait 1 to 2 minutes for students to count beans and record the total.



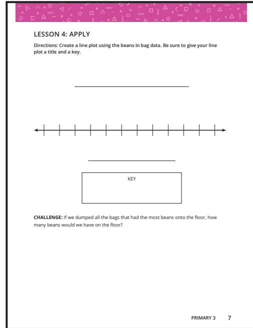
STUDENTS DO: Count the number of beans in bag and record on paper.

TEACHER SAY: **Now that we know how many beans are in each bag, I would like a quick way to show how many bags have a certain number of beans in them. I heard some ideas earlier about how to organize this data, but today we are going to learn about a new way to quickly show numerical data. NUMERICAL DATA means data that is number-based and measurable, like counting the number of beans. This new graph is called a LINE PLOT. Let's see how these work.**



Learn (35 to 45 minutes)

Directions


LESSON 4: APPLY

Directions: Create a line plot using the beans in bag data. Be sure to give your line plot a title and a key.

KEY

CHALLENGE: If we dumped all the bags that had the most beans onto the floor, how many beans would we have on the floor?

PRIMARY 3 7

1.**TEACHER SAY: A line plot is a quick graph that shows the data as x's above a number line, which is why it is called a line plot. It is a way to show the FREQUENCY of each value, or how many times that value exists in the data. For our data, that means how many bags have a certain number of beans. So I can make a line plot to quickly see this information.**

Let's make a line plot together to show the answer to my original question. Take out your student book and turn to page Lesson 4: Apply.

 **STUDENTS DO:** Take out student book and turn to page Lesson 4: Apply.

2.**TEACHER DO:** Draw an empty number line on the board.

TEACHER SAY: In your book, you will see an empty number line. Remember, a number line can start at any number, and the numbers can go on forever. We used number lines last year when we did addition and subtraction. To make our line plot today, first, we need to see how many beans are in the bags. I will call on each partner team and record their total on the board.

TEACHER DO: Call on each set of partners and record bean totals on the board. Do not put in numeric order but just record as they are collected. This will allow students to practice ordering the data, an essential part of creating a line plot.

 **STUDENTS DO:** When called on, state total number of beans.

TEACHER SAY: Now we can see how many beans are in each bag. If we are going to graph this data on a line plot, we need to know what numbers to include on the number line. Give me a Thumbs Up if you can tell me what is the fewest number of beans in a bag.

 **STUDENTS DO:** Give a **Thumbs Up** to share the fewest number of beans in a bag.

TEACHER SAY: The fewest number of beans in a bag is 51. That is the lowest number in this list of numbers of beans. It is our lowest numerical value. On a line plot, you place the lowest number below the empty number line on the left. Then you count up one by one until you reach the highest numerical value for your data, which means the highest number. Whisper what the highest value is.

 **STUDENTS DO: Whisper**: 62.

TEACHER SAY: Yes, 62 is the highest value. I am going to create my empty number line starting at 51 and going up to 62. You do the same in your student book.

TEACHER DO: Fill in the empty number line starting with 51 and going to 62.



STUDENTS DO: Create number lines as the teacher models.

3.**TEACHER SAY: Now that I have created my number line, I need to explain what these numbers represent. In this case, they are the number of beans in our bags. I need to label this line just like we do with a bar graph. Go ahead and label below your number line "Number of Beans in Our Bags."**

TEACHER DO: Add label to posted line plot.

 **STUDENTS DO:** Label the line plot Number of Beans in Our Bags.

TEACHER SAY: Now I need to graph how many bags had how many beans. I can do that by placing an x above the number. Like a pictograph, I can decide what each of my x's represents. For today, each x will mean 1 bag, and I will record that under my line plot, like a key.

TEACHER DO: Record x = 1 bag on the posted line plot.

TEACHER SAY: Next we need to figure out how many bags had 51 beans. There is a word that means "how many times a piece of data appears." That word is FREQUENCY. We can ask, "How many times does the number 51 appear?" or "What is the FREQUENCY of 51 in our data?"

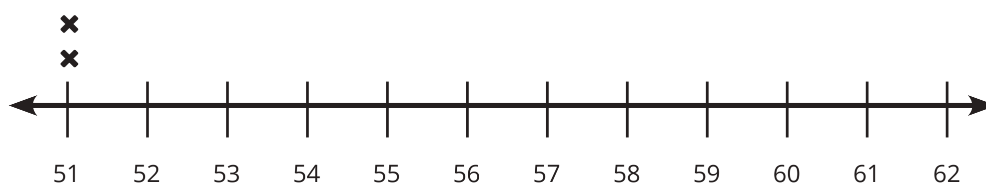
Check our data carefully, since it is not in order right now. Whisper how many bags had 51 beans. What is its frequency?

 **STUDENTS DO:** Look at board and determine how many bags had 51 beans. **Whisper** the answer.

TEACHER SAY: Yes, _____ (number of bags) had 51 beans. Now we can record that number of x's above the line. Watch me and then record on your line plot.

TEACHER DO: Model making x's above the line for the number of bags that had 51 beans.

Example:



Number of Beans in Our Bags
x = 1 bag

 **STUDENTS DO:** Record the number of bags that have 51 beans.

TEACHER DO: Repeat for 52 through 54. If there are no bags for a certain number, ask the students what they should record.

 **STUDENTS DO:** Repeat the process, making x's for the number of bags at each numerical value. Answer the teacher's questions about the data and next steps.

4. TEACHER SAY: You are now going to work with your Shoulder Partner to finish this line plot, recording all the data we have on the board.

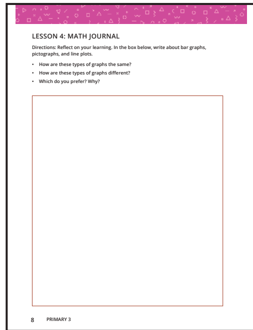
 **STUDENTS DO:** Work with a **Shoulder Partner** to finish plotting the data on the line plot.

TEACHER DO: Walk around the room and observe students completing their line plot. If students finish early, they can work with a partner to answer the challenge question in their book.



Reflect (5 to 10 minutes)

Directions



LESSON 4: MATH JOURNAL

Directions: Reflect on your learning. In the box below, write about bar graphs, pictographs, and line plots.

- How are these types of graphs the same?
- How are these types of graphs different?
- Which do you prefer? Why?

8 PRIMARY 3

1.TEACHER SAY: **Turn to page Lesson 4: Math Journal in your student book.**

 STUDENTS DO: Turn to page Lesson 4: Math Journal.

TEACHER SAY: **Today we learned about a new type of graph called a line plot, and we made one to show the number of beans on our bags. For Reflect, I want you to think about line plots versus bar graphs and pictographs. How are these graphs the same? How are they different?**

 STUDENTS DO: Write a response to the prompt in student book.

TEACHER DO: Give students 2 to 3 minutes to write about the prompt. If time permits, select two or three students to share.

TEACHER SAY: **Nice work with graphs these last three classes. You are really starting off the year working hard. We will look more at line plots in upcoming lessons and think about how they can be helpful to quickly show the frequency of data.**

Lesson 5 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students review measuring length and practice measuring sets of string in centimeters. The class will begin a Measurement anchor chart to use as a reference tool throughout the year.	Students will: • Discuss centimeter measurement. • Measure the length of objects in centimeters.	• Benchmark • Centimeter • Length • Units

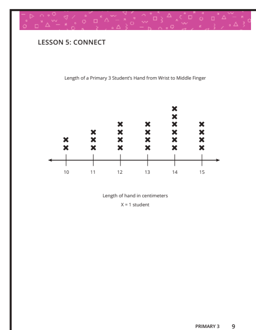
LESSON PREPARATION FOR THE TEACHER	MATERIALS
• Gather centimeter rulers (or have students cut out the centimeter rulers at the back of the Mathematics Student Books). • Make sets of string of different lengths. See details in Chapter Preparation for Lesson 5. • Make a Measurement anchor chart for class.	• Measurement anchor chart • Centimeter rulers (one for each pair of students) • Optional: Scissors to cut out centimeter rulers, if needed • Sets of five pieces of string (one set for each group of four students) • Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: Error analysis is a computational thinking practice. Students demonstrate a deep understanding of content when they can identify an error—their own or another's. Analyzing errors compels students to consider how and why they went wrong in their strategies or operations. This helps them to make connections between what they are learning and what they are practicing.



1. TEACHER SAY: **Take out your student book and turn to page Lesson 5: Connect.**



STUDENTS DO: Turn to page Lesson 5: Connect.

TEACHER SAY: **In our last class, we learned about a new type of graph, the line plot. We collected some data, organized it, and then we made a line plot to show frequency. Line plots are a great way to quickly show data.**

Look at the line plot in your book. You will notice that this line plot has a label under the number line, just like our bean plot from our last math lesson. Line plots always have a title to show what the numbers represent. A student in another class, Sahar, looked at this line plot and made this statement: Most of the students in the class have hands that are less than 13 centimeters long.

If you agree with Sahar, give a Thumbs Up. If you do not agree with Sahar, give a Thumbs Down.



STUDENTS DO: Give a Thumbs Up or Thumbs Down to show whether or not they agree.

TEACHER SAY: **Now turn to your Shoulder Partner and discuss why you agree or disagree. I will pick three Calling Sticks to hear your thinking.**

 **STUDENTS DO:** Turn and discuss Sahar's statement. Selected students share thinking and explain why they agree or disagree.

TEACHER DO: If necessary, explain that students can count the x's and see that 9 students have hands less than 13 centimeters long, but 14 students have hands that are 13 to 15 centimeters long. They should disagree with Sahar's statement.

TEACHER SAY: Give me a Thumbs Up if you have a statement that you can make about this data from the line plot. Let's hear from two or three students.

 **STUDENTS DO:** Give a **Thumbs Up** to share. Selected students share a statement.

TEACHER SAY: Nice job making accurate statements based on the data. This line plot is about the length of students' hands in centimeters. Today we are going to revisit measuring length and the units that we can use to measure length.



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Post the empty Measurement anchor chart on the board. Distribute rulers (or have students cut out the centimeter ruler at the back of the student book).

TEACHER SAY: During Connect, the data we looked at was about measurement. In Primary 2, we learned about measuring length, or how long something is. You have a tool that we use to measure length. Give me a Thumbs Up if you can share something you remember about this tool. I will use Calling Sticks to choose two or three students.

 **STUDENTS DO:** Give a **Thumbs Up** to share. Selected students share.

TEACHER SAY: Nice job. This tool is a ruler, and it is broken up into small units called centimeters. A centimeter is the distance between one line with a number over it and the next line with a number over it. Centimeters can help us measure small things. Can someone think of something in the room that we could measure with centimeters? Whisper into your hand.

 **STUDENTS DO: Whisper** something that could be measured in centimeters.

TEACHER SAY: Last year, we also talked about having a BODY BENCHMARK for a centimeter. A body benchmark is something on our body that is about that length and can help us think about the size even when we do not have a ruler. We discovered that a centimeter is about the same length as the width of your pinky (fifth finger from thumb) finger. Using the ruler I gave you, put your pinky finger between two lines. Is your pinky finger about a centimeter wide?

TEACHER DO: Model with ruler on the board.

 **STUDENTS DO:** Test if pinky is about a centimeter wide.

2. **TEACHER SAY: I have made an anchor chart for measurement that we can add to as we review and learn different units of length (point to anchor chart). It will hang in the room and help us remember the names of the units of length and how they are related. I am going to put centimeters on the chart in the second row, in case we have a smaller unit later. Centimeters is a long word to write, so mathematicians use cm for short.**

TEACHER DO: Fill in "centimeter (cm)" and for body benchmark write "width of pinky finger." Leave the column How Many Units for later once students discover and learn that 100 centimeters make a meter.

3. **TEACHER SAY: Now let's practice measuring some items. Remember that this is a tool, and using it correctly is important. I have a crayon here that I am going to measure with my ruler. Watch me and give me a Thumbs Up if I am using the tool correctly to find the length of the crayon or a thumbs down if i am using it incorrectly.**

TEACHER DO: Model incorrectly measuring a crayon. Do not line up the crayon from the left side but rather in the middle and then announce the length incorrectly based on the right side number.

STUDENTS DO: Observe teacher and give a **Thumbs Up** or **Thumbs Down**.

TEACHER DO: Call on someone with a **Thumbs Up** to explain their thinking. Then call on a student with **Thumbs Down** to explain their thinking.

Note to the Teacher: Calling first on someone who thinks your measurement mistake is correct allows you to hear what misconceptions might exist. Often while students are sharing they self-correct in the moment or after they hear from another student.

TEACHER SAY: I did not use this tool correctly. To measure accurately, I need to lay the crayon along the _____ (top or bottom of the ruler, depending on the ruler your students are using), lined up with the zero. Then I can read the length as the number of centimeters at the end of the crayon.

TEACHER DO: Model correctly measuring the crayon.

4. **TEACHER SAY: Great, now it is your turn. You are going to measure five pieces of string. You will be in a group of four, and each person needs to measure all five pieces. When you are finished, you will check each other's measurements to see if you agree on the lengths. Your last step will be to order the lengths from shortest to longest.**

Turn to page Lesson 5: Apply in your student book. You will see a table where you can record the length of each of your pieces of string. Under the table, there is a place for you to order the measurements from shortest to longest. To form groups, I will use Calling Sticks. Once you have your group, move to a spot in the room. Take your student book and centimeter ruler with you.

TEACHER DO: Show students the page and the pieces of string. Call four students to be a group using the **Calling Sticks**.

STUDENTS DO: Take out student book and ruler. Move to sit with small group. Work for the rest of the Learn time measuring the string sets in groups of four.

TEACHER DO: Walk around and observe students measuring in centimeters. Make a note of students who might need support or reteaching about measuring with centimeters. If students finish early, they can find objects in the room to measure. When the Learn time is over, bring the group back.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today we reviewed measuring length and reviewed the unit called a centimeter. Find page Lesson 5: Math Journal. Think about what you have learned about measurement and write about how you use measurement in the world outside of math class.**

STUDENTS DO: Write a response to the prompt.

TEACHER DO: Give students 2 to 3 minutes to write. If time permits, select two or three students to share.

TEACHER SAY: Good work today measuring in centimeters. For our next math class, we will think about how to measure something big, like a person or the entire classroom. Here is a question to think about: Are centimeters always the best unit to use when measuring length?

Lesson 6 Overview

LESSON OVERVIEW

In this lesson, students review meters and their relationship to centimeters. Students practice estimating the length of objects in centimeters and meters and determine when to use each unit of measurement.

LEARNING OBJECTIVES

Students will:

- Estimate the length of objects in centimeters and meters.
- Discuss meter measurement.
- Demonstrate understanding of the relationship between centimeters and meters.
- Determine whether to use centimeters or meters to measure length.

KEY VOCABULARY

- Centimeter
- Estimate
- Meter

MATERIALS

- Objects to estimate in centimeters
- Measurement anchor chart
- A meter stick or one created out of paper
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Gather objects to use to estimate length in centimeters. See Chapter Preparation for Lesson 6 for details.
- Add the word "meter" to Measurement anchor chart under Units of Measurement and that a meter is made up of 100 centimeters. Also add body benchmark of "nose to thumb on outstretched adult arm."



Connect (10 to 15 minutes)

Directions

1. **TEACHER SAY: Today we are going to look at objects and estimate their length in centimeters. Please turn to your Shoulder Partner and make sure you agree on what the word "estimate" means.**

 **STUDENTS DO:** Turn and talk to **Shoulder Partner** about the definition of estimate.

TEACHER DO: Give students **Wait Time** as they discuss definition. Then use **Calling Sticks** to have two or three students share their definitions.

TEACHER SAY: An estimate is an educated guess. It is when you take what you already know about something and apply it to a new problem. Since you already know about how long a centimeter is, you can ESTIMATE the length of objects. It is the opposite of an exact answer. If we use our eyes or our body benchmark to estimate the length of an object, what could we use to get an exact answer? Raise your hand if you think you know.

 **STUDENTS DO:** Raise a hand to share.

TEACHER DO: Call on students. If they are unsure, remind them that a ruler should be used to find an exact answer.

TEACHER SAY: I have a bag of objects, and you will estimate each object's length in centimeters. Remember that a centimeter is about the same length as the width of your pinky (fifth finger from thumb) finger. I will hold up an object and you will Whisper your estimate into your hand. Then I will pull a Calling Stick and have a student share their answer with the class.

TEACHER DO: Hold up first object.

 **STUDENTS DO:** **Whisper** estimates into hands.

TEACHER DO: Pull a **Calling Stick** and call on a student to share.



STUDENTS DO: One student shares answer aloud with class. Example: "I think the eraser is 5 centimeters."

TEACHER SAY: If you agree with _____'s (name of student) answer, please give me a Thumbs Up. If you disagree, give me a thumbs down. If you are unsure, put your thumb to the side.



STUDENTS DO: Use thumbs to convey understanding and agreement or disagreement.

TEACHER SAY: Now we will double-check by using my pinky finger. Watch as I use it to guide my estimate. I will start with it at the bottom of the object and then count up as I move it further up the object.

TEACHER DO: Count out centimeters—"about 1 centimeter, about 2 centimeters" and so on—until the object is measured.

TEACHER SAY: Great, now we know that this object is about _____ centimeters long. The more you practice estimating, the better you will become at it. Let's continue with some more of our objects.

TEACHER DO: Repeat the steps with two or three more objects. Double-check answers only if students' estimates are significantly inaccurate.



STUDENTS DO: For each object, students **Whisper** estimate into a hand, share estimate if selected, and show agreement using thumbs.

TEACHER SAY: Excellent job estimating objects in centimeters. Estimation is another tool that professional mathematicians use.



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Display Measurement anchor chart (if it is not already displayed). Show students a meter stick (or paper version of a meter stick).

TEACHER SAY: Remember at the end of our last math class, I asked if a centimeter would be a good unit to measure something big? Well, today we are going to move from a centimeter to a larger unit of measurement. Do you remember what this unit of measurement is called? Whisper the answer into your hand if you do.



STUDENTS DO: **Whisper** answer into hands.

TEACHER SAY: It is called a meter. A meter is made up of 100 centimeters. I have added the word "meter" to our anchor chart. I have also written that 1 meter, the length of this stick (or paper strip), is made up of 100 centimeters. Can you now look around our room and see if you can find anything that is about a meter long? Remember, we are just estimating. When you have found something, give me a Thumbs Up.



STUDENTS DO: Look around the room for things that are about a meter long and give a **Thumbs Up**. Examples may include window, desk, another student, and so on.

TEACHER DO: Give students **Wait Time** as they look around the room.

TEACHER SAY: Now I will use a Calling Stick to choose our first student. Please share your answer and then Popcorn to another student to share their answer. Let's see if we can come up with four different things in our room that are about a meter long.

TEACHER DO: Use a **Calling Stick** to call on the first student to share. Accept all reasonable answers.



STUDENTS DO: Share answers and then **Popcorn** to another student.

TEACHER SAY: **Nice work estimating. Now we will try that again, but this time looking for things that are about 2 meters in length. Remember to give me a Thumbs Up when you have an answer.**



STUDENTS DO: Look for objects about 2 meters in length. Selected students share answers and then **Popcorn** to another student.

2.TEACHER SAY: **You have now estimated objects in centimeters and meters. Centimeters are small. To help you remember, hold your fingers apart about a centimeter.**



STUDENTS DO: Hold fingers apart to make a centimeter.

TEACHER SAY: **As we hold our fingers apart to make a centimeter, we will say the word in a quiet voice like a tiny mouse.**

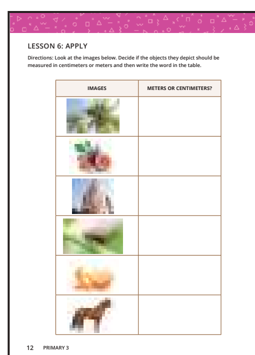


STUDENTS DO: Say "centimeter" while showing an estimate with fingers.

TEACHER SAY: **Good, now reach one arm all the way out to your side while saying "meter" in a big booming voice.**



STUDENTS DO: Reach one arm out and say "meter."



LESSON 6: APPLY

Directions: Look at the images below. Decide if the objects they depict should be measured in centimeters or meters and then write the word in the table.

IMAGES	METERS OR CENTIMETERS?

12 PRIMARY 3

TEACHER SAY: **Your arm may or may not be about a meter long, but it is a good way for you to remember that meters are used to measure big things and centimeters are used to measure smaller things. Turn to page Lesson 6: Apply in your student book.**



STUDENTS DO: Turn to page Lesson 6: Apply.

3.TEACHER SAY: **There are pictures in your book. Look at the objects in each picture and decide if they should be measured in centimeters or meters. If you think the object should be measured in centimeters, you will write "centimeters" beside the picture. If you think it should be measured in meters you will write "meters" beside the picture. Remember centimeters are used for small things and meters are used for larger things. If you finish early, try the challenge question in your student book.**

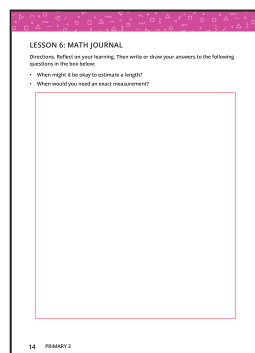


STUDENTS DO: Determine whether they would use centimeters or meters to measure the objects in the pictures.



Reflect (5 to 10 minutes)

Directions



LESSON 6: MATH JOURNAL

Directions. Reflect on your learning. Then write or draw your answers to the following questions in the box below:

- When might it be okay to estimate a length?
- When would you need an exact measurement?

14 PRIMARY 3

1.TEACHER SAY: **Turn to page Lesson 6: Math Journal in your book.**



STUDENTS DO: Turn to page Lesson 6: Math Journal.

TEACHER SAY: **For Reflect today, think about what you have learned about measuring and estimating. Think about the difference between an estimate and an exact measurement. When might it be okay to estimate a length? When would you need an exact measurement? Write and draw your answer in your Mathematics Student Book.**



STUDENTS DO: Write and draw a response to the prompts about measuring and estimating.

TEACHER DO: Give students 2 to 3 minutes to write about the prompt. If time permits, select two or three students to share.

TEACHER SAY: **You are all great thinkers. When you leave class today, look outside and around your house and see if you can find objects that would be measured in centimeters and objects that would be measured in meters. See if you can estimate some of the lengths of those objects. We will share what we find in our next math class.**

Lesson 7 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY

LESSON OVERVIEW

In this lesson, students discuss when to use centimeters or meters to measure the length of objects. They measure objects and compile the measurement data into a class line plot.

Note to the Teacher: Students work in small groups during the Learn section of Lesson 7. If class size makes this impossible, measure one set of items as a whole class, having different volunteers measure each item.

LEARNING OBJECTIVES

Students will:
- Measure the length of objects in centimeters.
- Use measurement data to create a class line plot.

KEY VOCABULARY

- Centimeter
- Line
- Meter

MATERIALS

- Prepared sets of small materials that can be measured in centimeters
- Large demonstration line plot
- Class set of rulers and one for teacher
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Prepare sets of classroom materials for students to measure. See details in Chapter Preparation for Lesson 7.
- Designate a place on the board to draw a line plot (or display a large piece of paper). Draw a blank number line with the number of hashmarks students will need to display their measurement data on a line plot. See Chapter Preparation for Lesson 7 for an example.



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Ask students to recall the objects they identified outside of school that could be measured in either centimeters or meters. Have students share their objects with a **Shoulder Partner** and discuss the unit of measurement they would use.

TEACHER SAY: Make sure you both agree. The taller student will go first.



STUDENTS DO: Discuss objects and selected units of measurement with **Shoulder Partners**. Decide whether or not they agree and discuss why or why not.

TEACHER DO: Give students time to talk, then use **Calling Sticks** to choose at least four students to share.



STUDENTS DO: Selected students share objects and units of measurement with the class.

TEACHER DO: Stop and discuss any incorrect answers. Make sure that there are examples of both centimeters and meters. If not, provide some for the class. Record students' answers on the Measurement anchor chart.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today we will measure objects and then use our data to create a line plot just as we did for the number of beans in our counting bags. You will work in small groups. Each group will receive a bag of items to measure. Your job will be to record and measure its length. Each person in your group should measure each object.

TEACHER DO: **Model** how this will be done on the board. Choose an item that is not in the student set, record what it is and its measurement. Remind the students to line the object up with the end of the ruler and to write “cm” after the recorded answer.

LESSON 7: APPLY

Directions: Use the table below to record your data. Remember to record the unit of measurement.

Name of Object	Length in cm

16 PRIMARY 3

TEACHER SAY: When you have recorded all of the lengths of the items we will come back together to share data and graph our answers as a class. You will record your measurements in your student book on page Lesson 7: Apply. Turn to that page now.



STUDENTS DO: Turn to page Lesson 7: Apply.

2. TEACHER DO: Put students into small groups of four and give each group a set of objects.

TEACHER SAY: Remember who you are working with today. You will work with the same group during Lesson 8.



STUDENTS DO: Move to work with small group. Measure each object and record data in the book.

TEACHER DO: Walk around the classroom and check that students are able to accurately measure objects and that they remember to record answers in the student book. At some point mid-lesson, find one child who is remembering to label all measurements with cm. When this happens, use an **Attention Getting Signal** to stop the class.

TEACHER SAY: Students, you are all working so hard on measuring your objects. I wanted to stop you for a moment and make sure you are all remembering to do what _____ (name of student) is doing. This student remembered to put cm after all of their measurements. If you do not write the units, someone might think you are measuring in meters. Please give me a Thumbs Up if you too are remembering to label your units.



STUDENTS DO: Give the teacher a **Thumbs Up** if they are labeling measurements properly. Continue measuring items.

TEACHER DO: When most of the class is done, use an **Attention Getting Signal** to have them stop.

3. TEACHER SAY: Even if you have not recorded all of the objects, please put them back into their container and set them aside. We will now look at your data and decide how to graph it on our line plot. First, how should we title this graph so people know what it is telling us? Turn and talk to your Shoulder Partner about what it could be titled. I will call on some of you using Calling Sticks.



STUDENTS DO: Turn and talk to a **Shoulder Partner** about possible titles for the line plot. Selected students share ideas with the class.

TEACHER DO: When an appropriate title (such as Lengths of Objects We Measured) is suggested, write it on the board as the title of the line plot.

TEACHER SAY: I will record the information on the board. You will record the information in your student book on page Lesson 7: Apply. How should we label the number line? Turn to your Shoulder Partner and share your thinking. I will use Calling Sticks to gather ideas.



STUDENTS DO: Share thinking with a **Shoulder Partner**. Selected students share ideas with the class.

TEACHER DO: Select an appropriate label, such as Length in Centimeters. Write it on the board.

 **STUDENTS DO:** Write the label on the line below the number line.

TEACHER SAY: **Wonderful, now we can create a line plot together. We will help each other create one on the board while you create your own in your math book. First, we start with a number line. What do you remember about number lines? Raise your hand to share what you know.**

 **STUDENTS DO:** Raise hand to volunteer. Selected students share what they know about number lines. Answers might include number lines go from lower numbers to higher numbers; number lines do not have to start at zero; number lines go on forever in both directions (even if we do not see them do that); the marks on a number line are evenly spaced.

TEACHER DO: If students do not share the information above, remind them.

TEACHER SAY: **Using your data, which object was the shortest one you measured? Which object had the lowest number? Raise your hand to share.**

 **STUDENTS DO:** Raise hand to volunteer. Selected students share thinking.

TEACHER SAY: **Remember, we start our line plots with the lowest number, so we will start our line plot with that number. Be sure to do the same thing in your student book that we do on the board.**

TEACHER DO: Use **Calling Sticks** to select a student to record the first number on the line plot.

 **STUDENTS DO:** Selected student writes the first number on the class line plot. All students do the same in the book.

TEACHER SAY: **What was the highest number you recorded? Which item was the longest? Raise your hand to share.**

 **STUDENTS DO:** Raise hand to volunteer. Selected student writes the largest data point on the right side of the number line. All students do the same in the book.

TEACHER SAY: **What is the next step? Give me a Thumbs Up if you know.**

 **STUDENTS DO:** Give a **Thumbs Up** if they know the next step. Selected students share thinking.

TEACHER DO: If no students suggest writing the numbers between the low and high numbers on the number line, explain the next step. Select a student to write the numbers on the number line.

 **STUDENTS DO:** Selected student records the in-between numbers on the number line. Student may ask for help from a friend, if needed. All students record the remaining numbers on the number line in the book.

TEACHER SAY: **Now that our number line is set up, we need to record our data and create a line plot. I will hold up an object you measured and select a student. They will share their answer in centimeters. If you have the same measurement, give them a Thumbs Up. Once we are all in agreement, we will record the data on the line plot. We will do this together for two objects, and then you will record the rest of your data on your own in your book.**

TEACHER DO: Use **Calling Sticks** to select students to share data. Make sure other students are in agreement. Since students are learning how to measure precisely, there may be discrepancies, which are good to discuss. Once students are in agreement about an object's length, select students to record the data (x's) on the line plot. Do this for two of the objects, and then students will continue on their own.

 **STUDENTS DO:** Share measurements for two of the objects. Selected students record the data on the board. All students record the data on the line plot in the student book. Students then work independently to record the rest of the data on the line plots in the student books.

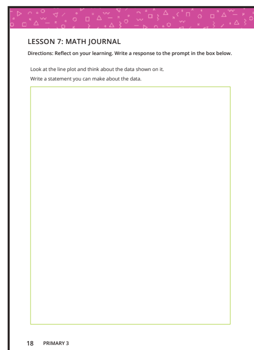
TEACHER DO: Walk around and check students' work. Do their measurements seem reasonable? Are they able to record data on line plots independently? If students need additional support, allow them to work with partners to finish the line plot.

TEACHER SAY: **Excellent job recording all of the data for our objects. Soon it will be time for you to make your very own line plots with new data.**



Reflect (5 to 10 minutes)

Directions


LESSON 7: MATH JOURNAL

Directions: Reflect on your learning. Write a response to the prompt in the box below.

Look at the line plot and think about the data shown on it.
Write a statement you can make about the data.

18 PRIMARY 3

1. **TEACHER SAY:** **For Reflect, look at our line plot and think about a statement, or something you know about the data. Write your statement in your student book on page Lesson 7: Math Journal. I will give you a couple of minutes to write.**

 **STUDENTS DO:** Write a response to the prompt.

TEACHER DO: If time allows, have students share statements with a **Shoulder Partner**. Be sure to review the statements later. This will help you identify students who need additional instruction and support. At the end of the math period, use an **Attention Getting Signal**.

TEACHER SAY: **Great job, students. You are all doing a wonderful job of measuring objects, using the data to create a line plot, and making statements from the data. This is important work that mathematicians and people use in everyday life. Look around you when you are home and see if you can find examples of graphs. They can be in newspapers, books, advertisements, and many other places. Once you begin looking for them, you will be surprised to see where they show up.**

Lesson 8 Overview

LESSON OVERVIEW

Students learn about the millimeter and determine which unit of measure to use (cm, m, mm) when measuring the lengths of objects. To build understanding of the relationship between millimeters and centimeters, they remeasure in millimeters objects that were previously measured in centimeters.

LEARNING OBJECTIVES

Students will:

- Demonstrate understanding that centimeters are composed of millimeters.
- Determine whether to use centimeters or meters to measure length.
- Measure the length of objects in millimeters.
- Describe the pattern they observe when measuring the same object in millimeters and centimeters.

KEY VOCABULARY

- Centimeter
- Greater than
- Less than
- Meter
- Millimeter

MATERIALS

- Images of objects to sort
- Sets of string (from Lesson 5)
- An object to measure in both centimeters and millimeters, such as an eraser
- Class set of rulers and one for teacher
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Use string sets that were prepared for Lesson 5.
- Gather rulers that show centimeters and millimeters (or have students cut out the centimeter/millimeter ruler at the back of the student book).
- Collect or draw images to be sorted into "measure in meters" or "measure in centimeters." See details in Chapter Preparation for Lesson 8.
- Have available an object that can be measured in both centimeters and millimeters, such as an eraser.



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Be sure the Thinking Like a Mathematician anchor chart is displayed where all students can see it.

TEACHER SAY: You all have been doing a wonderful job of thinking like mathematicians. Remember in our first math class we talked about ways to think like a mathematician? We discussed how mathematicians work through challenging problems and do not give up. One other way that we can think like a mathematician is to use our math tools accurately and to know when to use which tools. We have been practicing using rulers to measure correctly and determining when to use centimeters or meters. We are being mathematicians. We can add that to our chart and continue to practice using our measurement tools to measure accurately.

TEACHER DO: Record on Thinking Like a Mathematician anchor chart "Use appropriate tools correctly."

TEACHER SAY: Today I have several pictures of objects. I would like you to tell me if they should be measured in centimeters or meters. You will tell me by using your fingers or your arms. Remember, centimeters are small.

TEACHER DO: Hold fingers apart about a centimeter.

TEACHER SAY: And meters are big.

TEACHER DO: Hold out one arm to the side.

TEACHER SAY: **When I show you a picture of an object that should be measured in centimeters, put your fingers together to make a centimeter, and when I show you an object that should be measured in meters, hold out one arm to the side.**

TEACHER DO: Hold up images of objects.

 **STUDENTS DO:** Show the appropriate unit of measure with fingers and arms.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY:** **Today we are going to look at another unit of measurement. This unit is even smaller than a centimeter. It is about the width of the point at the end of your pencil or the thickness of 10 sheets of paper stacked together. So do you think this measurement is greater than or less than a centimeter? If you think it is greater than, or bigger than, a centimeter give me a Thumbs Up. If you think it is less than, or smaller than, a centimeter give me a thumbs down.**

 **STUDENTS DO:** Share thinking by giving a **Thumbs Up** or thumbs down.

TEACHER SAY: **Please take out your rulers.**

 **STUDENTS DO:** Take out rulers.

TEACHER SAY: **Millimeters are all the lines on the ruler. The centimeter lines are marked and drawn slightly longer, but if you count all of the lines, you are counting millimeters. Does that change your opinion of whether or not they are smaller or larger than a centimeter? Nod your head yes if you would like to change your answer. Shake your head no if you would like to keep it the same.**

 **STUDENTS DO:** Respond to the question.

TEACHER SAY: **Millimeters are smaller than centimeters. If you count the first millimeter mark to the 1 centimeter mark, you will see how many millimeters are in a centimeter. Follow along on your own ruler while I count them on mine.**

TEACHER DO: **Model** how to count aloud the millimeter lines on ruler while students follow along.

TEACHER SAY: **There are 10 millimeters in 1 centimeter. Think about what you know about counting by tens. Whisper to your Shoulder Partner how many millimeters you think will be in 2 centimeters.**

 **STUDENTS DO:** Turn and talk with partners.

TEACHER SAY: **Let's count together again to check. Remember to touch each line to help you keep track.**

 **STUDENTS DO:** Count aloud with the teacher as they count the millimeters on the ruler.

TEACHER SAY: **There are 20 millimeters in 2 centimeters. Nod your head yes if that was what you told your Shoulder Partner.**

 **STUDENTS DO:** Respond to the question.

TEACHER SAY: **Can anyone see the pattern? How many millimeters do you think there would be in 3 centimeters? Turn and discuss this question with your Shoulder Partner and give me a Thumbs Up when you agree on an answer.**

 **STUDENTS DO:** Talk to a partner and give a **Thumbs Up** when finished.

TEACHER SAY: **Please raise your hand if you would like to share your thinking.**

 **STUDENTS DO:** Raise a hand to volunteer. Selected students share thinking with the class.

Note to the Teacher: At this point in the year, it may be that students notice that when moving from centimeters to millimeters, the number gets a zero on the end. Later in the year, they may understand that you are multiplying the number by 10.

TEACHER SAY: **Remember a few math classes ago, I modeled how to measure a crayon, but I did it incorrectly at first and you helped me fix it? Let's go through the steps together again of how to measure an object correctly. Now I have an eraser in my hand. What should I do first? Raise your hand if you know.**

 **STUDENTS DO:** Raise a hand to volunteer. Selected students explain the first steps in measuring the length of an object with a ruler.

TEACHER DO: Repeat procedure until students have described all of the steps in measuring length with a ruler. If necessary, ask questions to help them think through the steps. Write the numerical portion of the answer on the board.

TEACHER SAY: **What unit of measurement should I add to the number?**

 **STUDENTS DO:** Call out: millimeter.

TEACHER SAY: **What wonderful mathematicians you are. Good mathematicians always remember to write the unit of measurement they are using after their measurement. If I just wrote the number, someone might think it was _____ (number) centimeters, or maybe even meters. We can abbreviate millimeter by writing mm.**

TEACHER DO: Add mm to the measurement on the board.

LESSON 8: APPLY

Directions: Measure the pieces of string and record their lengths in millimeters.

String Number	Length in mm
1	
2	
3	
4	
5	

PRIMARY 3 19

2. TEACHER SAY: **Today you will be practicing measuring the length of items in millimeters. Please take out your student book and turn to page Lesson 8: Apply.**

 **STUDENTS DO:** Open books to page Lesson 8: Apply.

TEACHER SAY: **Today you are going to measure the same pieces of string you measured in Lesson 5. However, that day you measured in centimeters, but today you will measure in millimeters. If you think the numbers will be greater when measuring in millimeters, give me a Thumbs Up. If you think the number will be smaller when measuring in millimeters, give me a thumbs down.**

 **STUDENTS DO:** Use thumbs to communicate current thinking about the relationship between millimeters and centimeters.

TEACHER SAY: **Now you will get a chance to see if your thinking is correct. You will work with the same group of friends you worked with in Lesson 5. Once I give you the signal, move to sit with your group. Remember that each person should measure each piece of string. It is okay for you to compare your answers. Remember to write millimeter or mm after each answer. Once you have your set of strings, you can get right to work.**

TEACHER DO: Give a signal for students to move to small groups. Once students are settled, distribute the string sets.

 **STUDENTS DO:** Measure and record the length of the strings. If time allows, compare answers with group members. Turn in all materials when finished.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Can you think of a time when you should measure in millimeters instead of centimeters? I am going to give you 30 seconds to see if you can come up with an idea.**

TEACHER DO: Give students **Wait Time** while they think.

TEACHER SAY: Now share your thinking with your Shoulder Partner.

 **STUDENTS DO:** Share thinking with a **Shoulder Partner**.

TEACHER DO: Pull **Calling Sticks** to have students share thinking.

 **STUDENTS DO:** Share thinking with the whole group if selected.

TEACHER DO: Accept all reasonable answers and pause to discuss any answers that may be unreasonable.

TEACHER SAY: You all worked hard today to understand that a millimeter is a smaller unit of measurement than a centimeter. You also described when it is appropriate to measure in millimeters rather than centimeters.

Lesson 9 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students are introduced to the final project and assessment for the chapter. They practice collecting data using a table and decide if given objects should be measured in centimeters or millimeters. They also create a system to keep track of data.	Students will: • Use a table to record data. • Measure the length of objects in millimeters or centimeters. • Determine whether to use meters, centimeters, or millimeters to measure length.	• Centimeters • Millimeters • Table

LESSON PREPARATION FOR THE TEACHER

- Prepare a large copy of the Length of P3 Students' Feet in Centimeters line plot. See Chapter Preparation for Lesson 9 for detailed instructions.
- Prepare sets of objects for students to measure in millimeters and centimeters (one set per group of four students). See Chapter Preparation for Lesson 9 for detailed instructions.
- Create a table for demonstrating how to record measurement data. This can either be on the board or a large sheet of paper. See Chapter Preparation for Lesson 9 for an example.

MATERIALS

- Length of P3 Students' Feet in Centimeters line plot
- Sets of objects to measure (one set per group of four students)
- Class set of centimeter/ millimeter rulers
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Display the Length of a P3 Students' Feet in Centimeters line plot where all students can see it.

TEACHER SAY: Today you will begin our final project to show your understanding of line plots and measurement.

TEACHER DO: Point out foot length line plot.

TEACHER SAY: This is a line plot showing Primary 3 students' foot length in centimeters. We are going to use this line plot as an example of the types of questions you will need to think about when you and your group create your own line plot. Please raise your hand if you can tell me the title.



STUDENTS DO: Raise a hand and share answer, if selected.

TEACHER DO: Ask students where this information can be found on the graph. Use **Calling Sticks** to have students answer the following questions:

- What unit of measurement was used?
- What is the label for the number line?
- What question does this line plot answer?
- What tools did I use to create this line plot?
- What information do I need to make this line plot?



STUDENTS DO: Respond to the review questions, explaining thinking when possible.



Learn (35 to 45 minutes)

Directions

LESSON 9: APPLY

Directions: Use the table below to record your data. Remember to record the unit of measurement.

Name of Object	Length in cm or mm

CHALLENGE: Pick three of your objects. If you laid them down one after the other, what would be the total length? Would it be more than or less than a meter?

20 PRIMARY 3

1. TEACHER SAY: Please open your student books to page Lesson 9: Apply.

 **STUDENTS DO:** Open student books to page Lesson 9: Apply.

TEACHER SAY: Today you and your small group will begin working on your final assessment for the chapter. An assessment is a chance for you to show all that you have been learning in math class. It is a time to slow down and make sure that you do your very best work. For this assessment, you will be given a set of items from our classroom. You will do the following steps.

TEACHER DO: Write the following steps on the board:

- Decide as a group what unit of measurement to use.
- Measure the length of each object using the unit of measurement you selected.
- Record the length of each object and label the measurement.
- Create a line plot to display your data.

TEACHER SAY: Some of you may have similar sets but your objects will have different measurements. For example, one group will have this set of pencils to measure (or object chosen). Who can help me read the directions? Raise your hand if you can help.

 **STUDENTS DO:** Raise a hand to volunteer. Selected students help the teacher read the directions on the board.

TEACHER DO: Explain or clarify directions as needed.

TEACHER SAY: Since the items in your set are similar, your group should create a system so you know which items you have measured and which ones you have not. Having a system is something that professional mathematicians do to help them solve real problems. Raise your hand if you think you have a good strategy for keeping track of which items you have measured already.

 **STUDENTS DO:** Raise a hand to volunteer. Selected students share strategies.

TEACHER DO: If necessary, share examples of strategies, such as starting with all of them in the box and taking them out as they are measured or starting with all of them out of the box and putting them back as they are measured.

TEACHER SAY: You will also need to record your data in your student book in the table provided. Can I have a brave volunteer who would like to come to the front of the classroom and show us how to record the data in the table on the board?

 **STUDENTS DO:** Selected student goes to the front of the classroom and walks through the steps for measuring the length of an object and recording the measurement with the correct label.

TEACHER SAY: Great work. Today you will be responsible for making sure you measure and record all of your items. You will all need to record the data in your book on page Lesson 9: Apply because each one of you will create your own line plot in our next math class.

TEACHER DO: Assign students to groups.

 **STUDENTS DO:** Move to work with group. Take ruler and student book.

TEACHER DO: Distribute one set of objects to each group.

 **STUDENTS DO:** Decide as a group what unit of measurement they will use. Measure and record the length of each item in their set. Label each measurement. At the end of Learn, put all supplies away.

TEACHER DO: As students work, observe their processes for measuring items and recording the measurements. Take note of students who may benefit from additional review and practice. Also, consider which students may be able to help others review and practice in the future.



Reflect (5 to 10 minutes)

Directions

Note to the Teacher: During this Reflect session, students consider the relationship between millimeters and centimeters and why it takes more millimeters to make the same measurement than in centimeters. Not all students may grasp this concept at this time. Revisit when possible to help more students build understanding.

1.**TEACHER SAY: Nice job today gathering the data you will need for your graph. For Reflect today, please think of which unit of measurement you and your group chose. Why did you choose that unit? Raise your hand if you would like to tell us what your objects are and how your group decided to measure them.**



STUDENTS DO: Raise a hand to volunteer. Selected students describe items and explain process for selecting a unit of measure.

TEACHER SAY: How would your data be different if you had picked a different unit of measurement? What would be different, for example, if you collected data about pencil length in centimeters versus millimeters? Share your thinking with your Shoulder Partner.



STUDENTS DO: Talk to partners about the differences they might observe if the same object is measured in centimeters versus millimeters.

TEACHER SAY: What did you decide? What would the differences be? Please raise your hand if you would like to share your thinking with the class.



STUDENTS DO: Raise a hand to volunteer. Selected students share thinking about the relationship between millimeters and centimeters when measuring the same object.

TEACHER DO: Listen to the ideas students come up with, specifically looking for the idea that the numbers would be larger in millimeters compared to centimeters. This discussion is critical in helping determine whether or not students are developing an understanding of the relationship between millimeters and centimeters.

TEACHER SAY: There is one more question I would like to ask you. I measured the length of an eraser in centimeters and it is 5 centimeters long. I measured it again in millimeters and it is 50 millimeters long. Why is the number in millimeters larger than the number in centimeters? Share your thinking with your Shoulder Partner.



STUDENTS DO: Talk to partners about why the number gets higher when the unit of measurement gets smaller.

TEACHER SAY: Please raise your hand if you would like to share your thinking.



STUDENTS DO: Raise a hand to volunteer. Selected students share understanding of the relationship between smaller units of measurement and larger numbers (and/or larger units of measurement and smaller numbers).

Lesson 10 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students complete a final assessment for the chapter and use a checklist to self-assess.	Students will: • Create a line plot using their collected data. • Evaluate their personal progress using a checklist. • Explain how they will use their new learning in their daily lives.	• Assessment • Centimeter • Checklist • Line plot • Millimeter

LESSON PREPARATION FOR THE TEACHER

- Create a large copy of the Length of KG2 Students' Feet in Centimeters line plot. See Chapter Preparation for Lesson 10 for detailed instruction.
- Write the checklist from the Mathematics Student Book on the board. See student book or Chapter Preparation for Lesson 10.

MATERIALS

- Length of a P3 Students' Feet in Centimeters line plot (from Lesson 9)
- Large copy of Length of KG2 Students' Feet in Centimeters line plot
- Checklist written on board
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Display the line plot from Lesson 9 beside the KG2 line plot. Direct students' attention to the graphs.

 **STUDENTS DO:** Observe the two line plots.

TEACHER SAY: What do you notice about these graphs? How are they the same? How are they different? I am going to give you 30 seconds of Think Time while you analyze, or carefully look, at both graphs.

 **STUDENTS DO:** Mentally compare the two line plots.

TEACHER SAY: Now turn and talk to your Shoulder Partner about what you notice about the graphs. When you are ready to share your thinking, raise your hand.

 **STUDENTS DO:** Share thinking with a **Shoulder Partner**. Raise a hand to volunteer. Selected students share observations with the class.

TEACHER DO: Encourage students to share what they see. Some students might point out that the x marks are the same. Some of them may notice that the lengths have changed. If they do not realize that the sizes are smaller, bring it to their attention.

TEACHER SAY: What could you infer, which is a fancy way of saying conclude or decide, about the people represented when looking at these two line plots? Raise your hand to share your thinking.



STUDENTS DO: Raise a hand to volunteer. Selected students share thinking.

TEACHER DO: See if students can infer that the second line plot's data is made up of younger people with smaller feet.

TEACHER SAY: Yes, we could infer that the people represented in this line plot might be younger and therefore have smaller feet. What might happen if we graphed the data of students in Primary 6? Turn and Talk to your Shoulder Partner.



STUDENTS DO: Share thinking with a **Shoulder Partner**.

TEACHER DO: Listen to the conversations students are having. See if they think that the numbers on the bottom of the graph would be larger or smaller. Take note of students who do not understand that larger feet would result in larger numbers on the bottom of the graph.



Learn (35 to 45 minutes)

Directions

1.TEACHER SAY: Today you will use all of the data that you and your group gathered from our last class and create your own line plot. Remember, this project is an assessment so make sure that you take your time and do your best work. This project will show me what you have learned and what you still need to work on. To help you, you will use a checklist in your student book so you can double-check that you have completed all parts of the assessment to the best of your ability. I will use the same checklist to assess your work.

TEACHER DO: Display the large copy of the checklist you created.

TEACHER SAY: Let's be teachers and practice using the checklist to see how well this student did.

TEACHER DO: Read aloud each item on the checklist. For each item, stop and ask students to look at the line plot and decide whether or not the "student" met the requirements. They can show their agreement or disagreement using **Thumbs Up** and thumbs down.

TEACHER SAY: If you did not finish measuring objects from our last class, you can use the first part of today's lesson to catch up. Please turn to page Lesson 10: Apply in your student book and begin working on your line plot.

LESSON 10: APPLY

Directions: Below is a checklist for you to use while you make your line plot. Make sure your line plot has all of the elements listed.

Checklist for Line Plot Assessment

- ☐ I gave my line plot a title.
- ☐ I labeled the number line.
- ☐ I wrote the units of measurement.
- ☐ My work is neat and organized.

Directions: Use the line below to create your line plot.

PRIMARY 3 21



STUDENTS DO: Turn to page Lesson 10: Apply. Work independently to create a line plot displaying the measurement data they collected during Lesson 9.

Note to the Teacher: After the lesson, collect the students' books and evaluate their work using the assessment checklist. Consider meeting individually with students who did not do well to ask them questions about their work, such as the following:

- *Why did you select this unit of measurement?*
- *What statement can you make from the data?*
- *Is your work appropriately labeled?*
- *How might you improve your line plot?*

For students who were able to complete the line plot quickly and accurately, consider meeting with them individually to ask questions that challenge them to think beyond the assessment, such as the following:

- *Under what circumstances might your data change?*
- *Why might the numbers on the number line change?*



Reflect (5 to 10 minutes)

Directions

1.TEACHER SAY: **An important part of learning is reflecting on what you have learned and thinking about what it means to you. How does it change what you knew or thought you knew? How will you use this new information? For Reflect today, you will reflect on your learning over the first 10 math lessons. Take a moment to think quietly about what you have learned about measurement, data, and graphing. What new skills or math concepts did you learn? How can you use that new learning? I will call on many of you after about a minute.**

 **STUDENTS DO:** Reflect quietly about their learning for about 1 minute.

TEACHER DO: Let students know when to wrap up the quiet reflection. Use **Calling Sticks** or another method to select students to share thinking.

 **STUDENTS DO:** Share thinking about the new skills and concepts they have learned and how they can use the new learning in daily life.

TEACHER DO: Record students' ideas on the board or on chart paper. Students may also mention something about the anchor charts, group work, or other aspects of the first 10 math lessons. Encourage all students to share thinking and be open to ideas you did not previously consider.

TEACHER SAY: **I really enjoy hearing your thinking and ideas. I love hearing how you are using your new skills and knowledge. We will continue to learn more together over the next ten math lessons. As you learn new things, think about how they connect to what you already know. Great job, everyone. I am very proud of you.**

PRIMARY 3

Mathematics

WHO AM I?

LIVING HEALTHY

Chapter 2

Lessons 11 to 20

Chapter 2: Lessons 11 to 20

Chapter Overview:

In Chapter 2 of Primary 3 Mathematics, students focus on reading and writing numbers to 100,000 using numerals (standard form), visual models (base ten blocks or pictures), and expanded form. This is a continuation of work students completed in Primary 2 with numbers up to 1,000. Students explore the concept that each place is 10 times greater than the one before it. Students also practice ordering sets of larger numbers from least to greatest and greatest to least. Reading and writing large numbers will continue throughout Primary 3. Mastery is not expected after this chapter, as exposure will continue over the course of the year. In the second half of this chapter, students investigate multiplication, a primary focus throughout Primary 3. Students connect arrays, repeated addition, and skip counting and explore how multiplication is often more efficient at finding a total. Students learn the terms and symbols associated with multiplication. Through a game, students make the connection between multiplication and equal groups. The Commutative Property of Multiplication is also introduced. This supports the development of a deep conceptual understanding of multiplication and, eventually, division.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop their ability to express mathematical ideas by talking about their discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from their peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 11 to 20, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.a. Explain products of whole numbers.
1.d. Use strategies to solve multiplication and division problems, including:
1)Manipulatives
2)Drawings
3)Arrays
4)The relationship between multiplication and division

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.a. Read and write numbers to 100,000 using numerals and expanded form.
1.b. Order a set of up to five numbers with values up to 100,000 from least to greatest or greatest to least.
1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

Computational Thinking

Throughout Lessons 11 to 20, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.d. Use strategies to solve multiplication and division problems.

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

CH 2 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
11	Students will: • Explain how the value of a digit can change based on its place value. • Apply strategic thinking to construct a four-digit number with a high value.
12	Students will: • Read and write numbers up to the Thousands place in standard form. • Read and write numbers up to the Thousands place in expanded form. • Create visual models of numerical value. • Compare numbers using symbols.
13	Students will: • Read and write numbers up to the Hundred Thousands place. • Compare and order numbers up to the Hundred Thousands place.
14	Students will: • Skip count by 2s, 5s, or 10s. • Read and write numbers up to the Hundred Thousands place in standard form. • Read and write numbers up to the Hundred Thousands place in expanded form. • Order a series of numbers up to the Hundred Thousands place.
15	Students will: • Identify and practice strategies for counting groups of objects.
16	Students will: • Use a variety of strategies to calculate the total number of items in an array. • Explain the strategies they used to calculate the total number of items in an array. • Solve repeated addition problems.
17	Students will: • Skip count by 3s. • Use drawings, arrays, equations, and physical models to solve repeated addition and multiplication problems. • Express repeated addition problems as multiplication problems. • Compare numbers using symbols.
18	Students will: • Compare arrays to equal groups. • Explain how repeated addition and multiplication equations are related. • Explain products of whole numbers. • Compare two products using greater than, less than, and equal to symbols.
19	Students will: • Solve multiplication problems using arrays. • Investigate the Commutative Property of Multiplication using arrays. • Create arrays to model the Commutative Property of Multiplication. • Explain multiplication and the Commutative Property of Multiplication.

LESSON	INSTRUCTIONAL FOCUS
20	Students will: • Solve multiplication problems using arrays. • Think strategically to solve a mathematical problem. • Use arrays to solve a real-world problem.

Chapter Preparation for Teacher

For Lesson 11:

- Write the numbers 1 to 9 on note cards large enough for students to see.
- Print out or create a set of number cards 1 to 9 (one set per small group of students). See Number Cards 1–10 Blackline Master.
    - Remove the 10 card from each deck.

For Lesson 12:

- Create a place value table on the board or on a poster:

Thousands	Hundreds	Tens	Ones

- Optional: Print a large copy of the Base Ten Manipulatives—Teacher Blackline Master.

For Lesson 13:

- Print one copy of the More or Less Than 1,000? Blackline Master.
- Create a blank place value chart to the Hundred Thousands place. Create enough rows to record several numbers.
    - In the first row, write the number 67,459.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
	6	7	4	5	9

- Create a large version of the Population of Egyptian Cities chart shown below.

Name of City	Population
Ash Shuhada	48,060
Matay	45,215
Suez	488,125
Sidi Salim	47,998
Port Said	538,378
Itsa	45,269
Juhaynah	47,821
Tamiyah	46,866
Luxor	422,407

  - Note: If students are struggling with place value concepts, consider including fewer cities in your chart. Be sure to include cities with populations in the ten thousands and hundred thousands.
- Create note cards showing the names of the cities (from the Population of Egyptian Cities chart) on the front and their population on the back.
  - Note: If you have reduced the number of cities in your chart, create only the population cards you need.
- Have available population information for your city or town.

For Lesson 14:
- Make sure the place value chart from Lesson 13 is prominently displayed for reference.

For Lesson 15:
- Print image of grocery store in a large format for board. See Grocery Store Blackline Master. (Students will have the same image in the Mathematics Student Book.)
  - If desired, an actual photo of a market or grocery store can be used.
- Have available poster paper or chart paper to record students' observations.

For Lesson 16:
- Print one copy of the Array Cards Blackline Master.

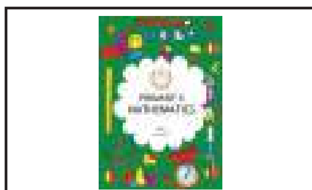
For Lesson 17:
- Cut long pieces of string to form three string circles large enough for four to six students to stand inside.

For Lesson 18:
- Gather six-sided dice (one die for each pair of students). If dice are not available, either create them using the Six-Sided Die-Number Cube Net Blackline Master or create and use the Six-Sided Spinner Blackline Master.

For Lesson 20:
- Print two 10 × 10 Array Blocks Game Boards (see the Array Blocks Game Board Blackline Master) or create two large 10 × 10 grids on the board.
- Gather six-sided dice (one die for each pair of students).
- Have available coloring tools for students.

Materials Used

Student book



Pencils

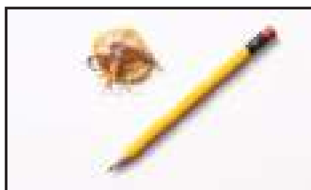
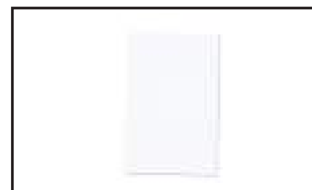


Chart paper



Poster paper



Large string circles



Scrap paper



Six-sided die



Crayons



Markers



Colored pencils



Large place value chart

Large number cards

Base ten manipulatives

Base ten blocks

Lesson 11 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students develop a deeper understanding of place value. They explore the difference between a digit and a number's value, for example, how a 3 is not always a 3 and can represent different values, such as 30, 300, or 3,000.	Students will: • Explain how the value of a digit can change based on its place value. • Apply strategic thinking to construct a four-digit number with a high value.	• Digit • Number • Place value • Thousand

LESSON PREPARATION FOR THE TEACHER

- Create a large teacher set of number cards 1 to 9.
- Print out or create a set of number cards 1 to 9 (one set per small group of students). See Number Cards 1–10 Blackline Master.
    - Remove the 10 card from each deck.

MATERIALS

- Large number cards 1 to 9
- Student sets of number cards 1 to 9 (one set per small group)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: The first question, "Is a 3 always a 3?," may seem simple at first. However, allow a few minutes for students to really explore the question. The digit 3, when in different place values, has different numerical values. Allow students to use their language to explore and develop this conceptual understanding.

1.TEACHER SAY: **As we begin our next topic in math, I want to ask you a question. It is a tricky question, so we will talk with Shoulder Partners. Is a 3 always worth 3?**

 STUDENTS DO: Talk to a **Shoulder Partner** to answer the question.

TEACHER DO: Call on students to share.

 STUDENTS DO: Selected students share thinking.

TEACHER DO: If no one identifies that a 3 could also be 30, 300, and so on, ask probing questions, such as:

- What would happen if there was another digit after the 3?
- What would happen if there were two more digits after the 3?

TEACHER SAY: **You are really growing your brains by thinking about challenging questions. Let's practice reading a few numbers now so that we can see what this looks like.**

2.TEACHER DO: Write several numbers with a common digit on the board, such as 4; 4,672; 84; and 491. Ask the class to read each number chorally. The purpose of this exercise is to hear larger numbers and connect to the idea that the place of a digit in a number changes its value. A 3 is not always read "three," depending on where it is in the number.



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Show the number 3,456 using your large number cards.

TEACHER SAY: Today we are going to deepen our understanding of place value. I showed the number 3,456 with note cards. This number is made up of the digits 3, 4, 5, and 6. Watch as I take those same digits and mix them around.

TEACHER DO: Create the number 6,543 with cards.

TEACHER SAY: Let's look at this number. It is made up of all of the same digits, so it must be the same number. If you agree with me, give me a Thumbs Up. If you think it is a different number, give me a thumbs down.

 **STUDENTS DO:** Respond to the question.

TEACHER DO: Call on various students to share thinking.

TEACHER SAY: These are not the same numbers. The order of the digits matters. When they are in a different place, their value is different. This is called place value. Practice saying this number with me.

TEACHER DO: Point to the number 6,543.

TEACHER SAY: Six thousand, five hundred forty-three.

 **STUDENTS DO:** Say six thousand, five hundred forty-three.

TEACHER SAY: This number has four digits. A digit is one numeral, either 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. In this large number, the 6 is in the Thousands place. It stands for 6 Thousands. Raise your hand if you can tell me the value and the place value of the 5 in this number.

 **STUDENTS DO:** Raise a hand to volunteer. Selected students share answers until the correct answer is shared.

TEACHER DO: Repeat procedure for the 4 and 3.

 **STUDENTS DO:** Raise a hand to volunteer. Selected students share answers until the correct answers are shared.

TEACHER SAY: Great job. If I put these digits in a different order, I am changing their place value and changing the value of the whole number.

2.TEACHER DO: Draw the game board below so the class can see.

Thousands	,	Hundreds	Tens	Ones		Discard

TEACHER SAY: Now we are going to play a new game called the Place Value Game. I drew four boxes on the board.

TEACHER DO: Touch each box starting with Ones and explain their value.

TEACHER SAY: I have a box for Ones, Tens, Hundreds, and Thousands.

TEACHER DO: Point to Discard box.

TEACHER SAY: **I also have a Discard box and cards with the numbers 1 to 9. The goal of this game today is to make the greatest number possible. To play the game, you will turn over a card and choose where to put the digit. You will decide if it should go in the Ones, Tens, Hundreds, or Thousands box. If you do not want to use the number, you can put it in the Discard box, but you can only use the Discard box one time. Once you have placed a digit in place, you cannot move it. We will play a round together.**

TEACHER DO: Please open your Mathematics Student Book to page Lesson 11: Apply.

STUDENTS DO: Open Mathematics Student Book.

TEACHER DO: Turn over a number card.

TEACHER SAY: **I drew a _____ (number). Decide which place value you would like to assign that number and write it in the box. Remember, we are trying to make the greatest number we can.**

STUDENTS DO: Decide where to put the first number and write it in a box.

TEACHER DO: Give students a moment to write the number themselves and then choose a place value box to write the digit on the board. Explain your thinking. Example: "I drew a 1. One is a small number. If I write it in the Thousands place, I do not think I will be able to make the greatest number. So I think I will put it in the Ones place." Remind students that their work does not need to be the same as yours.

TEACHER DO: Continue to draw cards until all boxes have been filled, giving students time to record choices in the books.

STUDENTS DO: Continue to play game, recording choices in the book.

TEACHER SAY: **My number is _____ (state number from board). Please raise your hand if your number was greater than mine.**

STUDENTS DO: Raise hands to respond. Selected students share numbers with the class.

3.TEACHER SAY: **Great, now we will play this game in small groups. You will take turns drawing a card. Each of you will decide where you want to put the number and record it in your book. You are not deciding as a group. After your group has drawn five cards and your boxes are filled, you will compare answers and see who has the greatest number.**

TEACHER DO: Put students into groups of three or four to play the game. Distribute sets of number cards to each group.

Note to the Teacher: This game can also be played with partners or the whole class, depending on class size. Students should eventually recognize they have to think strategically about creating large numbers.

STUDENTS DO: Move to work with small groups. Take student books and pencil. Play several rounds of the game. After each round, compare 4-digit numbers with the other numbers in the group.

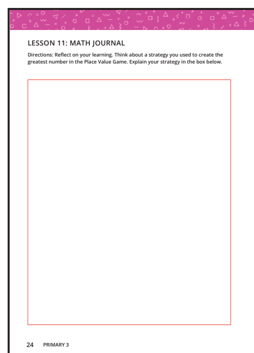
TEACHER DO: Walk around the classroom and ask students how they are deciding where to put the numbers.

STUDENTS DO: Put away all materials.



Reflect (5 to 10 minutes)

Directions


LESSON 11: MATH JOURNAL

Directions: Reflect on your learning. Think about a strategy you used to create the greatest number in the Place Value Game. Explain your strategy in the box below.

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1. **TEACHER SAY: Today you played a new game called the Place Value Game. For Reflect, please open your book to page Lesson 11: Math Journal and write about a strategy you used to make the greatest number.**



STUDENTS DO: Respond to the reflection and writing prompt.

TEACHER DO: Walk around and read what students write. If time allows, ask two to four students to share with the class.



STUDENTS DO: Put away all books and materials.

TEACHER SAY: Today you used both logic and strategy to play the Place Value Game. These are important practices in mathematics. Professional mathematicians use logic and strategy in their work too, just like you.

Lesson 12 Overview

LESSON OVERVIEW

In this lesson, students practice writing numbers to the Thousands place using standard notation and expanded form and create visual models of Base Ten blocks to show the numerical value of their numbers. Then they compare numbers with other students using greater than or less than.

LEARNING OBJECTIVES

Students will:
- Read and write numbers up to the Thousands place in standard form.
- Read and write numbers up to the Thousands place in expanded form.
- Create visual models of numerical value.
- Compare numbers using symbols.

KEY VOCABULARY

- Expanded form
- Greater than
- Less than
- Standard notation
- Thousand

MATERIALS

- Large place value chart
- Base Ten blocks (optional)
- Optional: Large copy of the Base Ten Manipulatives—Teacher Blackline Master
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Create a large place value chart on the board or on a poster.
- Optional: Print a large copy of the Base Ten Manipulatives—Teacher Blackline Master.



Connect (10 to 15 minutes)

Directions

1. **TEACHER DO:** Display place value chart showing Ones, Tens, Hundreds, and Thousands. If you have Base Ten blocks available, bring those out also.

TEACHER SAY: **In our last math class, we wrote and read numbers in the thousands. Today we will explore what these numbers actually look like and compare them. I want to show you some models of these numbers. You may remember them from Primary 2. Raise your hand if you can tell me something about each of these models.**

TEACHER DO: Show the Ones, Tens, and Hundreds models one at a time (using the chart, paper models, or Base Ten blocks). Start with the unit cube (Ones) and then show the Tens rod and then the Hundreds square. Allow a few students to share what they know about each one. Make sure everyone hears and is clear that the unit cube represents 1, the rod represents 10 because there are 10 unit cubes combined, and the Hundreds square represents 100 because there are 100 unit cubes, or 10 Tens rods, combined.



STUDENTS DO: Raise a hand to share something they know about each model the teacher shows.

2. **TEACHER DO:** Display or point to the Thousands model.

TEACHER SAY: **Now let's look at this new model. Turn and talk to your Shoulder Partner about what you notice about this model and what you think it represents. I will use Calling Sticks to hear from three people.**



STUDENTS DO: Talk to **Shoulder Partner** about the new model. Selected students share ideas.

Note to the Teacher: If necessary, explain that the Thousands cube represents 1,000 because there are 1,000 unit cubes, or 100 Tens rods, or 10 Hundreds squares combined. If Base Ten blocks are available, consider stacking 10 Hundreds squares so students can see it matches the Thousands cube.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: We will extend our lesson on place value today using drawings to help us model big numbers. Today each of you will practice working with numbers to the Thousands place. First, I will model what you will do.

TEACHER DO: Write 4,984 on the board.

TEACHER SAY: You will need to choose a number in the thousands. I chose this number. Read this number with me: Four thousand, nine hundred eighty-four.

 **STUDENTS DO:** Read number aloud with teacher.

TEACHER SAY: Now I need to draw this number using the same shapes from the Base Ten blocks. Show me on your fingers how many Thousands I need to draw.

 **STUDENTS DO:** Hold up 4 fingers.

TEACHER SAY: Yes, I need to draw 4 large cubes in the Thousands box. My cubes do not need to be perfect.

TEACHER DO: Draw cubes. These drawings do not have to be perfect but need to be different enough in shape to not look like Hundreds.

Thousands	Hundreds	Tens	Ones

TEACHER SAY: How many squares do I need to draw in the Hundreds box? Show me on your fingers.

 **STUDENTS DO:** Hold up 9 fingers.

TEACHER DO: Draw 9 large squares. Repeat with remaining units until entire number is drawn.

TEACHER SAY: Now that we have finished drawing the number, we will write it in expanded form. Remember, expanded form means we get to see the value of the number as an addition problem. Talk to your Shoulder Partner about what 4,984 would be in expanded form. When you are ready, raise your hand.

 **STUDENTS DO:** Talk to **Shoulder Partner** about how they would write 4,984 in expanded form. Raise hand to volunteer. Selected students share answers.

TEACHER DO: Call on a student to share and then write 4984 = 4000 + 900 + 80 + 4 on the board.

TEACHER SAY: These are your first three steps. When you have finished choosing your number, drawing it, and writing it in expanded form, you will compare your number with other students' numbers. We have special signs we use in math to show greater than, less than, and equal to. Raise your hand if you remember what they are.


STUDENTS DO: Raise hand if they remember.

TEACHER DO: Call on students to draw and name each symbol on the board.


STUDENTS DO: Selected students draw <, >, and = on the board and name each symbol.

TEACHER SAY: When do we use the equal sign?


STUDENTS DO: Raise hand to volunteer. Selected students share ideas.

TEACHER DO: If necessary, explain that whenever we use the equal sign, the value is the same, or balanced, on each side. Write 2 + 2 = 4 on the board.

TEACHER SAY: 2 + 2 is the same thing as 4. When do we use the greater than or less than signs?


STUDENTS DO: Raise hand to volunteer. Selected students share ideas.

TEACHER DO: Write 4,984 ____ 2,026 on the board.

TEACHER SAY: We use these signs to show comparisons between numbers. It is a much quicker way than writing the words "is greater than" or "is less than" each time. Who can come up and write the correct symbol between these two numbers? How do you know which number is greater?

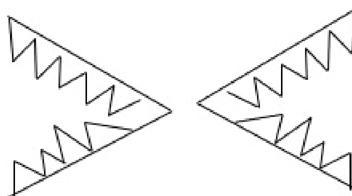
TEACHER DO: Call on a student to write the symbol on the board.


STUDENTS DO: Selected student writes a symbol on the board and explains how they know that 4,984 is greater than 2,026.

TEACHER DO: If necessary, help students understand why the greater than symbol is the correct symbol.

TEACHER SAY: You can remember how to use these symbols because they are like a crocodile's mouth. The crocodile always wants to eat the bigger number. So the big mouth is always facing the number that is greater.

TEACHER DO: Draw teeth on the greater than and less than signs.



Note to the Teacher: Later in this chapter, students will learn another method to help them correctly place the symbol and move away from the pictorial representation.

TEACHER DO: Repeat the procedure above using 1,001 ___ 3,980.

TEACHER SAY: Please take out your student book and turn to page Lesson 12: Apply.


STUDENTS DO: Take out books and turn to page Lesson 12: Apply.

TEACHER SAY: Read each step silently along with me.

STUDENTS DO: Read along silently with the teacher.

TEACHER DO: Answer any questions students have about the work.

TEACHER SAY: **If you finish early, please try the challenge work.**

STUDENTS DO: Complete the first three steps independently. Compare chosen numbers to those of three other students. If finished early, work on the challenge questions in student book.

TEACHER DO: Walk around the room and observe students, offering help if needed. Remind students that models can be a quick sketch. Ask students about strategies used to determine which number is greater.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY:** **We have learned about numbers to the Thousands place so far. What do you think happens when the numbers get even bigger? Please turn and talk with your Shoulder Partner to answer this question.**

STUDENTS DO: Talk with partner to discuss bigger numbers.

TEACHER DO: After about 1 minute, ask students questions such as:

- What do you think the place value is after Thousands? What about after that?
- What could we count with numbers bigger than a thousand?
- When do we use these really big numbers?

After a few minutes, bring the class back together with an **Attention Getting Signal**.

TEACHER SAY: **Let's hear some ideas as a whole class. Who would like to share?**

STUDENTS DO: Raise hand to volunteer. Selected students share ideas. All students listen and respond appropriately.

Lesson 13 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
Students explore really big numbers. Students consider what these numbers represent in life and practice reading and writing them in standard notation.	Students will: • Read and write numbers up to the Hundred Thousands place. • Compare and order numbers up to the Hundred Thousands place.	• Expanded notation • Hundred thousands • Standard form • Ten thousands

LESSON PREPARATION FOR THE TEACHER

- Print one copy of the More or Less Than 1,000? Blackline Master.
- Have available the sets of number cards 1 to 9 students used in Lesson 11.
- Create a place value chart to the Hundred Thousands place.
- Create a large version of the Population of Egyptian Cities chart in Chapter Preparation for Lesson 13.
- Create note cards showing the names of the cities from the Population of Egyptian Cities chart on the front and their population on the back.
- Prepare place value chart to the Hundred Thousands place, filled in with the number 67,459.
- Have available population information for your city or town.

MATERIALS

- More or Less Than 1,000 Blackline Master (one copy)
- Large version of the Population of Egyptian Cities chart
- Note cards with Egyptian cities on the front and their population on the back
- Place value chart to the Hundred Thousands place
- Student sets of number cards 1 to 9 (one set per small group)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: **In our last math class, we talked about numbers bigger than 1,000. Let's look at some pictures and think about whether they would contain real things that are more than 1,000. I will show you three pictures. For each picture, think for a moment and then stand up if you think the picture shows more than 1,000. Stay seated if you think the picture shows less than 1,000. We will talk about each picture with partners and then as a whole group.**

TEACHER DO: Show each picture from the More or Less Than 1,000 Blackline Master one at a time. Allow time for students to stand or sit and then ask **Shoulder Partners** to turn and talk about each one in turn. After a few minutes of student partner talk, ask volunteers to share their thinking.



STUDENTS DO: Observe pictures and determine whether they show more or less than 1,000. Talk to a **Shoulder Partner** about each picture. Share with the whole class, if selected.

TEACHER SAY: **Great conversation. Today we are going to talk about even bigger numbers.**



Learn (35 to 45 minutes)

Directions

1.**TEACHER DO:** Display the place value chart you prepared showing the number 67,459.

TEACHER SAY: Today we are going to add even greater numbers to our place value work.

TEACHER DO: Point to each place as you discuss it.

TEACHER SAY: It takes 10 Ones to make a Ten. It takes 10 Tens to make a Hundred. It takes 10 Hundreds to make a Thousand. Each place has a value 10 times greater than place to its right. How many Thousands do you think it takes to make Ten Thousand? Whisper the answer into your hand.

 **STUDENTS DO: Whisper**: 10.

TEACHER SAY: If you whispered 10, you are correct. It takes 10 Thousands to make Ten Thousand.

TEACHER DO: Point to the number 67,459 in the place value chart.

TEACHER SAY: When I count to 3, try to say this really big number out loud. 1, 2, 3.

 **STUDENTS DO:** Try to say the number aloud.

TEACHER SAY: Thank you for trying. Let's read this really big number, starting with the smallest parts first.

TEACHER DO: Cover everything but the Ones and have students chorally read it. Then show the Tens and Ones, progressing each time to reveal all the numbers.

 **STUDENTS DO:** Chorally read each revealed number (nine; fifty-nine; four hundred fifty-nine; seven thousand, four hundred fifty-nine; and sixty-seven thousand, four hundred fifty-nine).

TEACHER SAY: When we have really big numbers like this, we write a comma in between the Thousands and Hundreds. This is a cue for us to pause. So this number is read sixty-seven thousand (emphasize pause here), four hundred fifty-nine.

2.**TEACHER SAY: The same is true if we have digits in the Hundred Thousands place. These are really, really big numbers.**

TEACHER DO: Write a 2 in the Hundred Thousands place, changing the number to 267,459.

TEACHER SAY: Turn to your Shoulder Partner and tell them how you think you would read this really, really big number.

 **STUDENTS DO:** Read the number to **Shoulder Partner**.

TEACHER SAY: Let's read it all together. Two hundred sixty-seven thousand (emphasize the pause at the comma by pointing to each number and the comma), four hundred fifty-nine.

 **STUDENTS DO:** Read the new number aloud with the teacher.

TEACHER DO: Make sure students understand they can use the names of each place to help them understand how to read the number.

3.**TEACHER SAY: Now let's work with really big numbers. Today we are going to look at Egyptian cities with really big populations. The population of a city means the number of people who live there. Some are in the ten thousands and some are in the hundred thousands.**

TEACHER DO: Display the large Population of Egyptian Cities chart.

TEACHER SAY: First, let's practice saying the name of each city and its population.



STUDENTS DO: Go through the list of cities and practice saying the name and its population with the teacher.

TEACHER SAY: Let's order these cities from largest to smallest, or from most to least populated. Where should we start? Raise your hand if you have an idea.



STUDENTS DO: Raise hand to volunteer. Selected students share an idea about how to begin ordering the populations.

TEACHER DO: Discuss students' ideas. Students may recognize that numbers with the most digits are the largest. Students may also recognize that, in order to compare the numbers with six digits, they have to look at the Hundred Thousands place. Be sure students have identified and discussed effective strategies for ordering the populations.

TEACHER SAY: I have created cards with the names of these cities on one side and their populations on the other. I will pull Calling Sticks and, if I call your name, I will hand you a card. Hold your card so the population faces the class and the name faces you.

TEACHER DO: Call students to come to the front of the room. Give each of them a random card. Be sure you do not hand out the cards in numerical order.



STUDENTS DO: Selected students go to the front of the room and stand with the population numbers on their cards facing the class.

Note to the Teacher: Let students make mistakes in this activity and correct each other if they need to. Also, give students time to explain their thinking.

TEACHER SAY: Let's work together to put our population data in order from greatest to least. Look at the chart and see if you can decide which number should come first. Turn to your Shoulder Partner and share your thinking.



STUDENTS DO: Talk to a **Shoulder Partner** about which number is the greatest.

TEACHER SAY: Raise your hand if you have an idea. I also want to hear the strategies you are using to decide.



STUDENTS DO: Raise a hand to volunteer. Selected students share answers and explain strategies used.

TEACHER DO: Repeat process until all numbers are in order from greatest to least.

4. **TEACHER SAY: Great job organizing our cities from greatest to least by population. Please open your student book to page Lesson 13: Apply.**



STUDENTS DO: Find page Lesson 13: Apply.

TEACHER SAY: Now you will work with a small group to play the Place Value Game we played in Lesson 11. However, this time you will have numbers to the Hundred Thousands place. And, as an added challenge, your new goal is to make the smallest number possible that still uses all the places shown. Good luck.

TEACHER DO: Answer any questions students have about the directions. Put students into small groups of four or five. Give each group a set of number cards 1 to 9.



STUDENTS DO: Move to work with small groups. Take student books and pencil. Play several rounds of the game. After each round, compare six-digit numbers with other numbers in the group.

TEACHER DO: Walk around the classroom and ask students how they are deciding where to put the numbers.

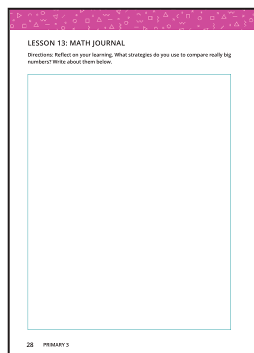
STUDENTS DO: Put away all materials.

Note to the Teacher: This game can also be played with partners or the whole class, depending on class size.



Reflect (5 to 10 minutes)

Directions



LESSON 13: MATH JOURNAL

Directions: Reflect on your learning. What strategies do you use to compare really big numbers? Write about them below.

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1. **TEACHER SAY: Excellent job reading, writing, and comparing really big numbers. On page Lesson 13: Math Journal, please think and respond to the question, "What strategies do you use to compare really big numbers?"**

STUDENTS DO: Reflect on learning. Write about the strategies used to compare large numbers.

TEACHER DO: Be sure to review students' entries. They will provide valuable information about students' current understanding of place value concepts.

Lesson 14 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students skip count to prepare them for upcoming multiplication lessons. They also read and write numbers up to the Hundred Thousands place using standard notation and expanded notation. Finally, students order numbers up to the Hundred Thousands place.	Students will: • Skip count by 2s, 5s, or 10s. • Read and write numbers up to the Hundred Thousands place in standard form. • Read and write numbers up to the Hundred Thousands place in expanded form. • Order a series of numbers up to the Hundred Thousands place.	• Expanded notation • Greater than • Less than • Order • Skip count • Standard notation

LESSON PREPARATION FOR THE TEACHER

Display the place value chart from Lesson 13.

MATERIALS

- Large place value chart from Lesson 13
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: Skip counting lays a foundation for understanding that multiplication is repeated addition. In Primary 2, students practiced skip counting by 2s, 5s, and 10s. Adjust this part of today's lesson if needed (skip counting by other numbers, skip counting quickly by 2s, 5s, and 10s, and so on). If students cannot recall skip counting, follow this script, which will walk them through it slowly for counting by 2s.

1.TEACHER SAY: **We are going to practice counting to warm up our brains today. First, we will practice counting to 20 by ones, forward and backward. When I point my finger up...**

TEACHER DO: Point finger up.

TEACHER SAY: **We will count forward, and when I point my finger down…**

TEACHER DO: Point finger down.

TEACHER SAY: **We will count backward. Watch my fingers to know whether to count up or down. A closed hand means stop.**

TEACHER DO: Make a fist.

TEACHER SAY: **Ready, let's begin.**

TEACHER DO: Count with students up and down to 20, stopping frequently at random points to switch the direction randomly. Example: point up—1, 2, 3, 4, 5, 6, 7, 8; point down—7, 6, 5, 4, 3, 2; point up—3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13; point down—12, 11, 10, 9, 8.

TEACHER SAY: **Good, now let's count to 20 forward and backward again. This time whisper every other number. So I will whisper 1 and say 2, whisper 3 and say 4, and so on. I will also be giving you hand signals so you know to count up or down.**

STUDENTS DO: **Whisper** and speak numbers. Spoken numbers should be multiples of 2.

TEACHER DO: Count with students and continue to give hand signals so they are counting both up and down by 2s.

TEACHER SAY: **Great job. We are going to do it again, but instead of whispering every other number, you will just think the number in your head.**

STUDENTS DO: Count by 2s, only saying the multiples of 2 while going forward and backward. If students are able, progress beyond 20.

TEACHER DO: Count with students and continue to give hand signals so they are counting both up and down by 2s.



Learn (35 to 45 minutes)

Directions

1.TEACHER SAY: **Now we will transition back to working with really big numbers. Today you will work with some really big numbers but will break them down into parts. We did this before, but let's do two together first so you can refresh your memory.**

TEACHER DO: Write 62,319 on the place value chart.

TEACHER SAY: **Turn to your Shoulder Partner and talk about how to say this number. See if you have the same answer.**

STUDENTS DO: Read the number to a **Shoulder Partner**.

2.TEACHER SAY: **Great. Remember that when we read this number, the comma tells us where to pause. Let's read it aloud together.**

STUDENTS DO: Read aloud the number with the teacher.

Note to the Teacher: If many students did not read the number correctly, break it down again, where you cover all but the digit in the Ones place and read it, and then uncover the digit in the Tens place and read it, continuing in this manner until all six digits have been revealed and read.

TEACHER SAY: **We will not draw this number with picture models, but if we did, how many Thousands cubes would we need? Please raise your hand to share.**

STUDENTS DO: Raise a hand to volunteer. Selected students share answers until someone responds with the correct answer (2).

LESSON 14: APPLY

Directions: Write each number in expanded form. Then practice reading each number in standard and expanded form (whisper).

62,319 = ____________________

762,319 = ____________________

15,780 = ____________________

812,004 = ____________________

Write your own really big numbers in standard form and then write them in expanded form.

______ = ____________________

______ = ____________________

Now order all the numbers you have above. Decide whether you want to order them from least to greatest or greatest to least.

______ ; ______ ; ______ ; ______ ; ______ ; ______

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3.TEACHER SAY: **I would like you to try to write this number in expanded form. Remember that we are just learning to work with really big numbers, so it is okay if you are not completely sure what to do. Please turn to page Lesson 14: Apply in your student book.**

STUDENTS DO: Turn to page Lesson 14: Apply in the book.

TEACHER SAY: **Work by yourself or with your Shoulder Partner to write this number in expanded form in your student book. In a few minutes, we will talk about it together.**

STUDENTS DO: Complete the application page.

Note to the Teacher: Some students may continue to struggle, and that is fine. In a moment, you will ask them to analyze any errors they made.

TEACHER SAY: **I will now share the expanded form of this number. If you made an error, now is your time to correct it. I see that there is a 6 in the Ten Thousands place, so the digit 6 has a value of 6 Ten Thousands, or 60,000. I start by writing 60,000. (Write this on the board.) The**

next digit, 2, is in the Thousands place, so it has a value of 2,000, so I write + 2,000. (Write this on the board.) Let's pause here. Look at your work and turn and tell your Shoulder Partner if you started this off the same way and, if not, what you now understand.

 **STUDENTS DO:** Analyze work and share with a **Shoulder Partner** what they did well and what they needed to change.

TEACHER DO: Circulate and listen as students share, reminding them that identifying, discussing, and fixing errors is a great way to learn. After 1 to 2 minutes, use an **Attention Getting Signal** to bring the class back together.

TEACHER SAY: **What courageous students would like to share what they learned by making an error?**

 **STUDENTS DO:** Selected students talk about the errors they made and what they now know.

TEACHER SAY: **I am so impressed with your learning. Thank you for sharing. Let's keep going. I now see the 3 digit in the Hundreds place, so I will add + 300 to my equation. (Write + 300 on the board.) The 1 is in the Tens place, so that is adding 10 more. (Write + 10 next on the board.) And finally, there is a 9 in the Ones place, so I will finish writing the expanded form of this number with + 9. (Write this on the board.) Please check your own work to make sure you have this number written correctly in expanded form.**

 **STUDENTS DO:** Check work and adjust if needed.

TEACHER SAY: **Raise your hand if you would like to try one more together.**

Note to the Teacher: If the majority of your class needs or wants to do another problem together, do one more using the same process as above but with the number 762,319. If the majority of your class is ready for independent work, move on to the next step in the lesson.

4. **TEACHER SAY:** **Now you will do some more like these on your own. Below the sample problem(s) we did are some numbers that have been given to you to do and two spaces for you to make up your own really big numbers and write in expanded form. After you write the expanded form for each number, you will order them. You can choose whether you will order them from least to greatest or greatest to least. If you have a question about your work, please raise your hand. (Answer any questions that arise.) You may begin.**

 **STUDENTS DO:** Work independently for the remainder of the Learn time period in the student book. Ask questions if needed.



Reflect (5 to 10 minutes)

Directions

1.**TEACHER DO:** Write five digits on the board.

TEACHER SAY: **For today's Reflect, I have written five digits on the board. What is the biggest number you could make with those five digits? I will give you a minute to think and then you will Turn and Talk with your Shoulder Partner.**



STUDENTS DO: Think quietly for a moment. After the teacher gives a signal, **Turn and Talk** with a **Shoulder Partner**, comparing answers.

TEACHER DO: Listen to students' conversations and answers.

TEACHER SAY: **Did everyone agree on the answer? Did any partners come up with different numbers? Raise your hand if you could not agree on how to make the largest number.**



STUDENTS DO: Raise hand, if appropriate. Selected partners share numbers with the class.

TEACHER DO: Write the numbers on the board and analyze them as a class.



STUDENTS DO: Work together to analyze and compare the two numbers provided by classmates.

TEACHER DO: If time allows, repeat the above procedure but this time looking for the smallest number possible.

TEACHER SAY: **You all worked hard today and have done a wonderful job learning about place value.**

Lesson 15 Overview

LESSON OVERVIEW

This lesson lays the foundation for developing a deep understanding of multiplication. Students were introduced to arrays in Primary 2, and in this lesson they delve into multiplicative reasoning as they share their observations about groups of objects. You will not yet talk about the work as multiplication. The focus is on seeing, identifying, and making groups as they develop strategies to solve real-world problems.
In this lesson, students are introduced to multiplication with arrays in a grocery store. They locate different arrays and find the total number of objects, sharing their strategies.

LEARNING OBJECTIVES

Students will:

- Identify and practice strategies for counting groups of objects.

LESSON PREPARATION FOR THE TEACHER

Print image of grocery store in a large format for board. See the Grocery Store Blackline Master. (Students will have the same image in their Mathematics Student Book.)

Have available poster paper or chart paper to record students' observations.

KEY VOCABULARY

- Groups
- Sets

MATERIALS

- Poster of grocery store
- Chart paper or poster paper
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: This Connect begins with a picture of a grocery store with items in groups or arrays. This is designed to help students start to look for groups and think about how to efficiently determine the total (product). If you would rather use an actual image of a market or store where items are arranged in arrays, you are encouraged to do so.

1.TEACHER SAY: **Let's look together at this picture of a grocery store. Turn to your Shoulder Partner and discuss what you see in this picture and how the items are arranged. Give a Thumbs Up when you are ready to share your observations.**



STUDENTS DO: Turn and talk to **Shoulder Partner** about the what they see in the image and the arrangement of the objects. Give a **Thumbs Up** when ready to share.

TEACHER SAY: **Thinking like a mathematician, let's hear what you notice about this picture. I will record your observations on this chart paper (or on the board) so that we can discuss them later.**

TEACHER DO: Call on two to four students, or as many as time permits, to share their observations. Encourage students to make mathematical observations and talk about the strategies they are using. A sample conversation with prompts is below.

TEACHER: Tell me what you see.
STUDENT: I see apples.
TEACHER: How are the apples arranged?
STUDENT: In rows (or groups or columns).
TEACHER: How many rows (or groups or columns)?
STUDENT: 4 rows.
TEACHER: How many apples are in each row?
STUDENT: 3.
TEACHER: Okay. (Records 4 groups of 3 on chart paper.) So how many apples do you think there are?
STUDENT: Answers may include 3 + 3 + 3 + 3 = 12 apples.
TEACHER records students' work on the chart paper.

STUDENTS DO: Selected students share observations about the grocery store image.

TEACHER SAY: Is there another way to find the total number of apples?

STUDENTS DO: Selected students share strategies.

TEACHER DO: Continue to record students' observations. Each time, challenge students who are not making mathematical observations ("I see cans or bananas") to find a new way to state observations. Also, ask questions such as, "If there are three bunches of bananas, and each bunch has three bananas, how can I figure out how many bananas there are?" Some students may refer to the groups as sets of bananas or cans. As you are recording, circle or underline the words "groups of" and talk about the term, making the meaning and use explicit.

Encourage students to use whatever strategies make sense to them and to explain their thinking. This will help students understand that there is often more than one way to solve a problem.

TEACHER SAY: I notice that a lot of you are seeing groups of things in this picture. The items in the store are not randomly arranged, and using the word "groups" is a good mathematical way to describe the arrangement of these items. It makes it easier for us to find the total number of objects when objects are arranged in a group. That is what we will work on more today with partners.



Learn (35 to 45 minutes)

Directions



1. TEACHER SAY: Let's look more closely at this image. Take out your student book and turn to page Lesson 15: Apply.

STUDENTS DO: Take out student book and turn to Lesson 15: Apply.

TEACHER SAY: On this page, you will see a smaller version of our grocery store. In Connect, many of you noticed that the objects were arranged in groups and not just randomly placed. Take 1 minute and circle all the groups of objects you see in the picture.

STUDENTS DO: Circle all the groups of objects in the book.

TEACHER DO: Wait 1 minute for students to circle all the groups of objects that they see in the image. Use **Calling Sticks** to select students to circle groups of objects on the large poster.

STUDENTS DO: Selected students circle groups of items on the large poster.

TEACHER SAY: Great work. I noticed that the apples and cans are in groups that have rows with the same number in each row, but the bananas are in bunches with the same number of bananas in each bunch, or group. All of these items are in groups, and earlier we discussed how many total apples there were. Today you will work to find the total number of items in as many different groups of items as you can. You will record how you found the total number just like _____ (name of student who helped in Connect) shared about how they found the number of apples. I am very interested in seeing the strategies that you use.

TEACHER DO: Walk around to observe how students find the totals. Note students who use repeated addition, those who just count the items one by one, and those who break the problem into chunks (seeing two groupings of two by three groups). This is important information about students' mathematical thinking. If students finish early, they can work on the challenge problems.

STUDENTS DO: Spend the rest of the Learn time finding the total number of items in each group. Record thinking in student book.

2. TEACHER DO: When 5 minutes are left in the Learn section, bring the group back together.

TEACHER SAY: Nice work finding the total number of items in each group. Raise your hand if you would like to share the strategy you used to find the total for one of the groups.



STUDENTS DO: Raise a hand to volunteer. Selected students go to the front and explain thinking.

TEACHER DO: Choose one student to share with the large group. Record their thinking as they explain. If time permits, ask if anyone else solved the same problem but in a different way. All students will get a chance to share with a **Shoulder Partner** in Reflect.

TEACHER SAY: Nice work today looking at groups and determining how many items were in each group.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: For Reflect, think about how you found the total number of objects in each group.**

TEACHER DO: Name some of the students who volunteered and remind the group of the strategies they used.

TEACHER SAY: Now, turn to your Shoulder Partner and share your thinking. Did you use the same strategy to find the total for all of the groups? Were some of the groups harder to work with than others? Why?



STUDENTS DO: Turn and Talk about strategies for finding the total number of items in each group. Discuss whether or not some groups were harder to calculate and why.

TEACHER DO: Wait 2 to 3 minutes for partners to share. Walk around and listen to partners' strategies. If time allows, ask for volunteer partners to share their thinking.



STUDENTS DO: Selected partners discuss conversations with the whole group.

TEACHER SAY: Great job today looking at groups and thinking about how to find the total number of items in a group. We heard several different, interesting strategies. We will continue to work all year on this concept of groups and finding the total number of things in groups of all sizes. We will look for ways to find totals quickly and efficiently.

Lesson 16 Overview

LESSON OVERVIEW

In this lesson, students continue to explore arrays and multiplicative strategies such as repeated addition or skip counting rather than counting one by one to find the total.

LESSON PREPARATION FOR THE TEACHER

Print one copy of the Array Cards Blackline Master.

LEARNING OBJECTIVES

Students will:
- Use a variety of strategies to calculate the total number of items in an array.
- Explain the strategies they used to calculate the total number of items in an array.
- Solve repeated addition problems.

KEY VOCABULARY

- Array
- Columns
- Efficient
- Repeated addition
- Rows
- Skip counting

MATERIALS

- Array Cards (stars, apples, cans)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER SAY: To start math today, we are going to practice counting by different numbers. The other day in math, we skip counted by 2s (and 5s and 10s, if students were able to do so). Last year we practiced skip counting by 2s, 5s, and 10s.

Today we are going to try and skip count by 3s. This is tricky. When I say start, we will begin whisper counting. We will whisper two numbers and then say the third out loud and clap. I will record the numbers we say aloud on the board. We will keep going, whispering two numbers and then clapping and saying aloud the next number, like this:

TEACHER DO: Model how to whisper 1, 2; clap and state 3; whisper 4, 5; clap and state 6; and so on. If necessary, use a 1 to 100 (or 120) chart to help students understand which numbers they are skipping and the pattern that creates.

TEACHER SAY: This is tricky, and it might take us a little while. That is all right. Remember that when we are thinking like a mathematician, we stick with a challenge and persevere. Ready to try?

TEACHER DO: (Point to anchor chart Thinking Like a Mathematician). Count with students and record on the board the multiples of 3 up to 36.



STUDENTS DO: Count up to 36, clapping on each multiple of 3 and whispering all the other numbers.

TEACHER SAY: Good job. That was tricky. We will keep this list on the board. It might help us today solve some of our math problems.



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Put up a copy of the first array of stars on the board.

TEACHER SAY: How many stars are on this page? Lean and Whisper to your Shoulder Partner.

 **STUDENTS DO: Lean and Whisper** total number of stars (15).

TEACHER SAY: Now look at this array of stars.

TEACHER DO: Put up the second array on the board, which is in an array showing 5 × 3.

TEACHER SAY: How many stars are on this page? Lean and Whisper to your Shoulder Partner.

 **STUDENTS DO: Lean and Whisper** total number of stars (15).

2. **TEACHER SAY: Both star images have 15, but I am curious how you found the total of 15 stars in this array. Give a Thumbs Up to share your strategy.**

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected students share strategies.

TEACHER DO: If possible, call on students until two different counting strategies have been shared. Record students' strategies. Ideally, students will describe counting by 3s and counting by 5s, but if not, that will be explicitly explained soon.

TEACHER SAY: Was it easier to find the total in the first array or the second? Hold up one finger for the first array and two fingers for the second. Then I will call on someone to share their thinking.

TEACHER DO: Call on a student with one finger up and then two fingers up. Most students should have two fingers, but allow for those with one finger to share their reasoning.

 **STUDENTS DO:** Hold up one finger or two. Selected students share thinking with the group.

3. **TEACHER SAY: It seems that most of you agree that it is easier to determine the total when the stars are arranged in an ARRAY. Like you just saw, arrays are helpful because they are organized and make counting quicker. Array is a mathematical word that describes a group of ROWS (show card and point to rows) and COLUMNS (point to columns). Every row has the same number of objects in it (point to each object). Every column has the same number of objects in it (point to each object).**

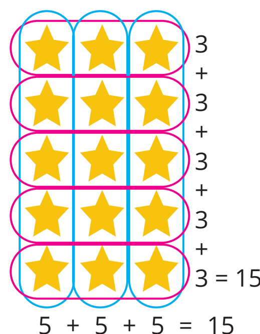
TEACHER DO: Before moving on, confirm that students understand the difference between rows and columns. Have students move arms in a horizontal motion to signify rows and in a vertical motion to signify columns.

 **STUDENTS DO: Model** the direction of rows and columns using arms.

TEACHER SAY: We noticed that this array of stars has 5 rows with 3 stars in each row. Some of you may have counted the rows of 3: 3 + 3 + 3 + 3 + 3. Some of you may have skip counted the rows of 3: 3, 6, 9, 12, 15.

Some of you may have noticed 3 columns of 5 stars and counted those as 5 + 5 + 5. Some of you may have skip counted columns by 5s—5, 10, 15.

TEACHER DO: Use the array card to help students understand the repeated addition strategies. Circle the columns and rows in different colors and record the repeated addition problems. See the example image below.




LESSON 16: APPLY

Directions: Look at each star array and record the number of ROWS and the number of stars in each ROW. Then find the total number of stars. Use the work space on the next page to show how you found the total.

1.

Number of rows: ______

Number of stars in each row: ______

Total number of stars: ______

2.

Number of rows: ______

Number of stars in each row: ______

Total number of stars: ______

3.

Number of rows: ______

Number of stars in each row: ______

Total number of stars: ______

4.

Number of rows: ______

Number of stars in each row: ______

Total number of stars: ______

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TEACHER SAY: **Both of those are EFFICIENT strategies. An efficient math strategy is the quickest way to correctly solve a problem. Mathematicians work to find efficient ways to solve problems. Counting the stars one at a time is a strategy that works. We can find the total number of stars that way. But it is not EFFICIENT. It is not quick. A quicker way to count is to count 3 groups of 5 or 5 groups of 3. You might have a different strategy, and that is okay, but this year we want to work toward more efficient strategies.**

Now let's look at another array. Take out your student books and turn to page Lesson 16: Apply.



STUDENTS DO: Take out student book and turn to page Lesson16: Apply.

4.TEACHER SAY: **On this page, you will see a variety of star arrays. How do we know these are arrays? Raise your hand if you know.**



STUDENTS DO: Raise a hand to volunteer. Selected students share ideas.

TEACHER DO: Students should indicate they are arrays because each row has the same number of stars and each column has the same number of stars. Be sure to explain this if no students are able to.

TEACHER SAY: **Today you will work independently. In the first part of the practice, you will record how many rows there are and how many items are in each row. Then you will find the total and record the counting strategy you used. In the second part of the practice, you will record how many columns there are and how many items are in each column. Then you will find the total and record the counting strategy you used. Try to use an efficient strategy to find the totals instead of counting one by one, if possible. If you finish early, first check your work, then try the Challenge problem.**

TEACHER DO: Help students understand the two different sets of directions by looking through the student book with them. Read aloud the Challenge problem and remind students they should check their work before starting the optional Challenge problem.



STUDENTS DO: Work in the student book for the rest of Learn time to calculate the total number of stars in each array. Show counting strategies in the Work Space. Explain thinking if asked by the teacher.

TEACHER DO: Walk around the class, observing students working. Ask students questions that guide their thinking, such as:

- How do you see this array? (3 rows of 2 or 2 columns of 3)
- How did you find the total?
- Why did you choose to solve the problem that way?
- Is there a different way to solve this problem?

Halfway through work time, use an **Attention Getting Signal** to pause students.

TEACHER SAY: **I am interrupting your work time so we can quickly share some wonderful strategies and help each other a bit. Who would like to share one way they solved one of these problems?**

 **STUDENTS DO:** Raise a hand to share a strategy.

TEACHER DO: Call on two or three students to share different strategies.

TEACHER SAY: **What great thinking. Please continue working.**

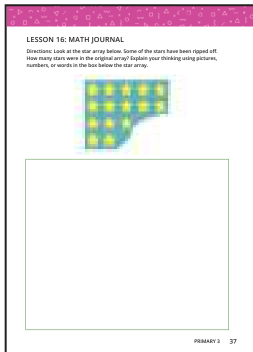
5. **TEACHER DO:** Use an **Attention Getting Signal** to close the Learn section of class.

TEACHER SAY: **Nice work today finding the total number of stars by skip counting or using repeated addition. Keep out your student books for Reflect.**



Reflect (5 to 10 minutes)

Directions


LESSON 16: MATH JOURNAL

Directions: Look at the star array below. Some of the stars have been ripped off. How many stars were in the original array? Explain your thinking using pictures, numbers, or words in the box below the star array.

PRIMARY 3 37

1. **TEACHER SAY:** **Turn in your student book to page Lesson 16: Math Journal. On this page, there is an array of stars, but some have been ripped off. Determine how many stars were originally on the page and explain your thinking in the box using pictures, numbers, or words.**

 **STUDENTS DO:** Solve ripped star problem in student book.

TEACHER DO: Give 2 to 3 minutes for students to work through the problem. If time allows, use **Calling Sticks** to have a few students share answers and reasoning.

 **STUDENTS DO:** Put away student books.

TEACHER SAY: **Nice work today with arrays. Arrays are a very organized way to see a group of objects. Next time, we are going to think about another way to look at groups of objects.**

Lesson 17 Overview

LESSON OVERVIEW

In this lesson, students take a break from arrays to see a different way to think about equal groups and discuss multiplication. Students need to be flexible thinkers with a deep understanding that multiplication is equal groups or equal items and that can be seen in an array or in other grouping arrangements. The word "multiplication" is introduced and the multiplication symbol is formally introduced as well. Students play Circles and Dots to practice making groups with equal numbers of objects in each group.

LEARNING OBJECTIVES

Students will:
- Skip count by 3s.
- Use drawings, arrays, equations, and physical models to solve repeated addition and multiplication problems.
- Express repeated addition problems as multiplication problems.
- Compare numbers using symbols.

KEY VOCABULARY

- Equal
- Greater than
- Less than
- Multiplication
- Product
- Total

LESSON PREPARATION FOR THE TEACHER

Cut long pieces of string to form three string circles large enough for four to six students to stand inside.

MATERIALS

- Three large string circles
- Scrap paper to play Circles and Dots
- 1 six-sided die (for teacher use)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. **TEACHER SAY: For the past two math classes, we have looked at arrays and practiced skip counting. Let's try skip counting again. But this time I have a different question. How many times do we need to skip count by 2s to get to 10? Let's try this together first. Each time you say a number aloud, I will hold up a finger.**

TEACHER DO: Lead the class to skip count by 2s (an easy number hopefully). As they say 2, hold up 1 finger; as they say 4, hold up 2 fingers; and so on.

 **STUDENTS DO:** Skip count chorally by 2s to 10.

TEACHER SAY: Each time you said a number, I held up a finger. How many times did you count by 2 to get to 10? Whisper in your hand please.

 **STUDENTS DO: Whisper**: 5.

TEACHER SAY: Right. We counted by 2s five times to get to the total of 10. Let's try this with partners. One person will skip count and one person will hold up their fingers each time they hear a number. Turn to your Shoulder Partner and decide who will count first and who will hold up their fingers first.

 **STUDENTS DO:** Determine roles with partner.

TEACHER SAY: Work with your partner to figure out how many times we have to skip count by 2s to get to the total of 18. When you know the answer, raise your hand.

 **STUDENTS DO:** Work with a partner to determine the answer and then raise hand to share.

TEACHER DO: Call on at least two sets of partners to see if they got the same answer. Ask if anyone got a different answer and discuss as needed.

TEACHER SAY: Fantastic. We had to count by 2s nine times to get to the total of 18.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: Today we will change our focus a bit and look at groups of objects, like the bananas in the store the other day. I have put out three big circles on the floor that are made of string. I will roll one die and then choose that many people to go stand in each circle. Then we will find the total number of students. Ready?**

TEACHER DO: Place string circles on the floor. Roll die (or have a student roll it) and choose that many students to go stand in each circle. For example, if you rolled a 3, you would have three students stand in each circle.

STUDENTS DO: Selected students stand in an assigned circle.

TEACHER SAY: Okay, so we have created three groups. We have _____ students in each group. Lean and Whisper how many students we have in all standing in the circles.

STUDENTS DO: Lean and Whisper the total.

TEACHER SAY: If you said we have ______ students, you were correct. Give a Thumbs Up if you can share how you found the total.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share strategies.

2. **TEACHER SAY: Nice job. I am going to record on the board a repeated addition equation. How many students are in each group? Hold up that many fingers silently.**

STUDENTS DO: Hold up _____(number rolled on die) fingers.

TEACHER SAY: Great. There are _____ students in each group. How many groups are there? Hold up that many fingers.

STUDENTS DO: Hold up 3 fingers.

TEACHER SAY: So there are _____ students in three groups. I can add _____ three times like this: (write on board) _____ + _____ + _____ = _____. Another way I can write this is 3 × _____ = _____. We read this as, "Three times _____ equals _____."

TEACHER DO: Fill in the multiplication equation.

TEACHER SAY: So we added _____ (number rolled on die) 3 times OR we can say 3 times _____ (number rolled on die). Both of these equations have the same total. Raise your hand if you have ever seen this symbol (point to "x").

STUDENTS DO: Raise hand if they have seen it.

TEACHER SAY: This is called a multiplication symbol. Make this symbol with your hands and say it aloud with me.

STUDENTS DO: Make an x with their hands and say, "Multiplication."

TEACHER SAY: Yes. Multiplication tells us how many times we need to add a number to get the total. Let's try it again. We will keep the three circle groups but roll for a new number of students in each circle.

TEACHER DO: Repeat the process as above. This time, have students do as much of the thinking

and work as possible, helping you determine what to write for the addition and multiplication equations.

 STUDENTS DO: Repeat the process from above. Determine how to write both the addition and multiplication equation based on the number of students in the three circles. Explain thinking and strategies used when asked.

TEACHER SAY: **So in the first problem, we wrote 3 × _____ (number rolled) = _____, and in the second we wrote 3 × _____ (number rolled) = _____. What stayed the same in both problems? What changed? Lean and Whisper to your Shoulder Partner.**

 STUDENTS DO: **Lean and Whisper** answer.

3.TEACHER SAY: **Great. The number of groups stayed the same. Each time we added a number 3 times in our repeated addition equation. What changed was the number of students.**

Now we are going to play a game called Circles and Dots. Today we will play class against teacher. I will hand out a piece of scrap paper for you and your Shoulder Partner.

TEACHER DO: Hand out scrap paper to **Shoulder Partner** teams.

TEACHER SAY: **I will go first. I will roll the die. That will tell me how many circles to draw on the board. I will roll the die again. That will tell me how many dots to put in each circle. After I draw, I will find the total and write one repeated addition equation and one multiplication equation. Then it will be your turn.**

TEACHER DO: **Model** how to play. Roll the die twice and draw the circles and the dots based on the rolls. Then find the total and record one repeated addition equation and one multiplication equation. Be explicit in showing how your addition equation is linked to your multiplication equation. Example: 3 circles with 4 in each. 4 + 4 + 4 = 12, so 3 groups × 4 in each = 12.

TEACHER SAY: **Remember, in multiplication we are just adding one number a certain number of times. Now it is your turn. Raise your hand if you would like to roll for the class.**

 STUDENTS DO: Raise a hand to volunteer. Selected student goes to the front of the room.

TEACHER SAY: **You will roll the die once to find the number of circles and again to find the number of dots. and draw the circles and dots on the board while the rest of the class draws on their paper. You will write a repeated addition equation and a multiplication equation but do not record the total yet.**

 STUDENTS DO: Selected student rolls the die for the group and writes on the board while the rest of the students record on paper the circles and dots and their equations.

TEACHER SAY: **Nice job. _____ (selected student) rolled a _____ and a _____, so they drew _____ circles with _____ dots in each. They wrote a repeated addition equation and a multiplication equation but did not put in a total yet. Whisper how many total dots there are.**

 STUDENTS DO: **Whisper** the total.

TEACHER SAY: **Now _____ (selected student) can record the totals for both equations.**

 STUDENTS DO: Selected student records the totals for both equations.

TEACHER SAY: **Look at my total and your total. Thumbs Up if I have a greater total, and thumbs down if you have a greater total number of dots.**

 STUDENTS DO: Give a **Thumbs Up** or thumbs down to respond.

TEACHER SAY: **I had a _____ (greater or lesser) total than the class. We can record that comparison using greater than, less than, or equal to symbols in the same way that we compared the numbers a few days ago. The highest number wins.**

TEACHER DO: Record the comparison sentence on the board.



STUDENTS DO: Record the comparison sentence.

TEACHER SAY: Let's play again.

TEACHER DO: Continue to play against the class, choosing a different student each time to model.

Note to the Teacher: If students are still drawing crocodile teeth to remember the symbols, teach them the strategy below.

An easy way for students to consistently use the correct < or > symbol is to have them put one dot by the smaller number and two by the larger. Then connect the lines.

26 < 42



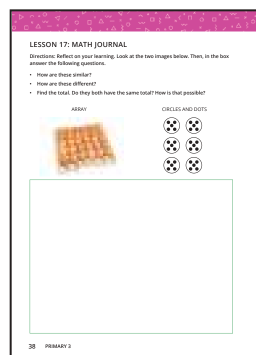
STUDENTS DO: Continue to play the game against the teacher, recording the circles and the dots that the chosen student rolls and writing repeated addition and multiplication equations to find totals. Compare both totals.

TEACHER SAY: Great job today with Circles and Dots. We learned a new word today, multiplication, and practiced writing equations that use the multiplication sign.



Reflect (5 to 10 minutes)

Directions



LESSON 17: MATH JOURNAL

Directions: Reflect on your learning. Look at the two images below. Then, in the box answer the following questions.

- How are these similar?
- How are these different?
- Find the total. Do they both have the same total? How is that possible?

ARRAY

CIRCLES AND DOTS

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1. **TEACHER SAY: Take out your student books and turn to page Lesson 17: Math Journal.**



STUDENTS DO: Take out student book and find the correct page.

TEACHER SAY: On this page, you will see two images. One is eggs arranged in an array. The other is a picture of a round of Circles and Dots. Look at both images and reflect on your learning. Then write about how both pictures are the same and different. Also, find the total number of eggs and the total number of dots and compare. Think about why each has that total.



STUDENTS DO: Look at the images and reflect on how they are alike and different. Write out reasoning on the journal page.

TEACHER DO: Give 2 to 3 minutes for students to work through the problem. If time allows, use **Calling Sticks** to have a few students share answers and reasoning.



STUDENTS DO: Put away materials.

TEACHER SAY: Nice work today with multiplication. Multiplication is used whenever we have equal groups with equal objects in each group. Sometimes this is arranged in an array and sometimes it is not. We will revisit Circles and Dots next math class.

TEACHER DO: Be sure to review students' work and journal entries in the student book to determine their current level of understanding of arrays and whether or not they are starting to make a connection between repeated addition and multiplication.

Lesson 18 Overview

LESSON OVERVIEW

In this lesson, students play the game Circles and Dots with a partner and are introduced to the word "product" as the answer to a multiplication problem. They write repeated addition and corresponding multiplication equations.

LESSON PREPARATION FOR THE TEACHER

Gather six-sided dice (one die for each pair of students). If dice are not available, either create them using the Six-Sided Die-Number Cube Net Blackline Master or create and use the Six-Sided Spinner Blackline Master.

LEARNING OBJECTIVES

Students will:

- Compare arrays to equal groups.
- Explain how repeated addition and multiplication equations are related.
- Explain products of whole numbers.
- Compare two products using greater than, less than, and equal to symbols.

KEY VOCABULARY

- Multiplication
- Product

MATERIALS

- Six-sided dice (one die for each partner team)
- Mathematics Student Book and pencil

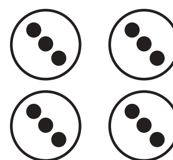


Connect (10 to 15 minutes)

Directions

Note to the Teacher: Error analysis is a computational thinking standard. Identifying an error, articulating why an error might have occurred, and correcting the error helps students build deep mathematical understanding.

1.TEACHER DO: Record the following on the board:



Rehab's equation: $4 + 3 = 7$
Dalia's equation: $4 \times 3 = 12$

TEACHER SAY: On the board is a round of Circles and Dots like we played in our last math class. Rehab and Dalia were partners. Rehab wrote an equation for the total number of dots and so did Dalia. Look at their equations and then Turn and Talk to your Shoulder Partner about each student's equation and answer. What do you notice? I will use Calling Sticks to hear from a few of you.

TEACHER DO: Wait 1 to 2 minutes for students to talk to partner. Then use **Calling Sticks** to select two or three students to share thinking.

 **STUDENTS DO:** Selected students share thinking.

TEACHER DO: Guide discussion of the error with the following questions: Why do you think Rehab just added 4 and 3? What do those numbers mean?

 **STUDENTS DO:** Engage in error analysis and a discussion about the sample students' work.

TEACHER DO: Summarize the sample students' work and their errors as needed.

TEACHER SAY: Good discussion. Rehab wrote an addition equation. She added 4 + 3 = 7. She might have thought she had 4 circles and 3 dots but that does not give us a total number of dots. Dalia saw that there were 4 groups and each group had 3 dots. Since there were equal groups with the same number of items in each, she could write a multiplication equation using the multiplication symbol—4 × 3 = 12. To get the total, she might have added 3 + 3 + 3 + 3. How else could Dalia have found the total number of dots to be 12? Give a Thumbs Up to share.

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected students share thinking.

TEACHER DO: Record students' ideas for how to find the total number of dots.

Note to the Teacher: At this early point in the year, students may still be finding the total counting one by one. Do not worry. The goal is for students to see that equal groups of equal items is what multiplication represents. The total (product) can be found by repeated addition 3 + 3 + 3 + 3 or 6 + 6 or even skip counting by 3s: 3, 6, 9, 12. Allow students the opportunity to find the products in ways that make sense for them right now, while guiding them toward noticing other more efficient strategies. As the year progresses, more focus will be spent on mastering these multiplication facts, but lots of practice and exposure early will bring more success later in the year.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: Today we are going to get a chance to play Circles and Dots with a partner, but before we do that, let's talk a little more about multiplication. Yesterday we discussed how multiplication uses a special sign and Dalia used it in our earlier example. Can you show me that sign with your hands?**

 **STUDENTS DO:** Make an × with their hands.

TEACHER SAY: Yes, the multiplication sign is an x. Multiplication is just adding one number over and over again a certain number of times, but instead of recording a long repeated addition equation, I can write a multiplication equation. Let's look at this equation on the board.

TEACHER DO: Write on the board

5 + 5 + 5 + 5 = ______

TEACHER SAY: How many times does the number 5 appear in this equation? Show me on your fingers.

 **STUDENTS DO:** Hold up 4 fingers.

TEACHER SAY: Yes, there are four 5s. Raise your hand if you can come up and write a multiplication equation to show that we added 5 four times.

 **STUDENTS DO:** Raise hand and come up to write 4 × 5 =.

TEACHER SAY: Yes, we have 4 groups of the number 5, so 4 × 5 =. Lean and Whisper what the answer to 4 × 5 is and how you found it.

 **STUDENTS DO: Lean and Whisper** 20 and discuss the strategy.

TEACHER SAY: Good thinking. Last year we learned that the answer to an addition problem is called the SUM. This year, when we multiply two numbers and find the total, we are finding the PRODUCT. Say, "Product."

 **STUDENTS DO:** Say, "Product."

TEACHER SAY: Great. Now if I was playing Circles and Dots and wrote this equation to go with my game, what would my picture look like? Raise your hand if you would like to draw it on the board.

 **STUDENTS DO:** Raise hand to come up and draw 4 circles with 5 dots in each.

Note to the Teacher: It is possible that a student may draw 5 circles with 4 dots, which is also correct mathematically, but the Commutative Property will be discussed in more detail in the next lesson. For today, do not worry too much about which way students draw it.

2. TEACHER SAY: Nice job. You drew 4 circles with 5 dots in each. This picture represents the multiplication equation on the board. Thumbs Up if you also think this image that I am going to draw could represent the equation on the board. Turn your thumb down if you think it does not.

TEACHER DO: Draw an array with 4 rows and 5 dots in each. Ask a student with a thumb down to explain why they think it does not. Then ask a student with **Thumbs Up** to explain why it does. Circle back to the first student to be sure that they understand this array also shows 4 × 5 (4 rows with 5 in each).

 **STUDENTS DO:** Give a **Thumbs Up** or thumbs down and share thinking if chosen.

3. TEACHER SAY: Good. Both the array and the circles and dots show 4 groups with 5 in each. Now let's spend the rest of our math lesson playing Circles and Dots with our Shoulder Partners. Take out your student book and turn to page Lesson 18: Apply.

 **STUDENTS DO:** Take out student book and turn to page Lesson 18: Apply.

TEACHER SAY: On this page, you will find a space to draw your Circles and Dots. One partner will come up and get a die. Then roll to find the number of circles and roll again to find the number of dots. Draw your circles and dots, taking turns with the die. After you draw, record a repeated addition equation and a multiplication equation. There is an example at the top of the page. After both you and your partner have found your products, record them. Them compare your products using a greater than, less than, or equal to symbol as we did yesterday. The highest product wins that round. Continue playing until Learn time is over. If you play all of the rounds, try the Challenge problem.

 **STUDENTS DO:** Get dice and play Circles and Dots for the rest of the Learn time. If the entire page gets used, try the Challenge problem. At the end of Learn, put away all supplies.

Note to the Teacher: If you have students who are very comfortable with multiplication already and know their 1 to 6 facts, you can have them play Circles and Dots with number cards 6 to 10. This will enable them to practice finding products where the factors are larger than the numbers on the dice.



Reflect (5 to 10 minutes)

Directions

1.**TEACHER DO:** Write the following questions on the board:

- What does it mean to multiply?
- How is multiplication like addition?
- How are you feeling about multiplying? Do you think it is hard or easy? Why?

TEACHER SAY: Nice job today playing Circles and Dots. We have worked with arrays and equal groups for the last four math classes. Today we are going to think about multiplication.

TEACHER DO: Read aloud the questions on the board.

TEACHER SAY: Think quietly for 30 seconds. When the time is up, I will clap and you can turn and share with your Shoulder Partner the answer to any or all of these questions.

TEACHER DO: Wait 30 seconds for students to think and then clap. Walk around and listen to what students are sharing.

STUDENTS DO: Think quietly about the teacher's questions. Then share thinking with a **Shoulder Partner**.

TEACHER SAY: Great work these last four math classes thinking about arrays and equal groups. I am so impressed with your conversations and the strategies you have been using. We will keep working a lot this year on multiplication and what it means and how to solve problems using multiplication, but we are off to a strong start. Give your Shoulder Partner a high five.

STUDENTS DO: Give **Shoulder Partner** a high five.

Lesson 19 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
Students may already have noticed the Commutative Property of Multiplication. Today students explicitly explore and practice this property. Some students may recall that addition is also commutative, and this connection will be made.	Students will: • Solve multiplication problems using arrays. • Investigate the Commutative Property of Multiplication using arrays. • Create arrays to model the Commutative Property of Multiplication. • Explain multiplication and the Commutative Property of Multiplication.	• Commutative Property • Factor • Multiplication • Product

LESSON PREPARATION FOR THE TEACHER

No additional lesson preparation needed.

MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER SAY: **We are going to spend a few minutes today remembering addition. It will help us in a few minutes. Turn and tell your Shoulder Partner about five things you remember about addition. When you hear me clap, stop talking and we will share. Ready? Go.**

 STUDENTS DO: Tell a **Shoulder Partner** what they remember about addition.

TEACHER DO: Listen to students' conversations. Find students who have unique things to share. Clap after a few minutes to bring the group back together.

TEACHER SAY: **I will ask a few of you to share your ideas about addition.**

 STUDENTS DO: Selected students share ideas.

TEACHER SAY: **Great remembering. Now let's talk about something important about addition. What is the sum of 4 + 5? (Write 4 + 5 on the board.) Please whisper it.**

 STUDENTS DO: **Whisper**: 9.

TEACHER SAY: **Good. And what is the sum of 5 + 4? (Write 5 + 4 on the board.) Please whisper it.**

 STUDENTS DO: **Whisper**: 9.

TEACHER SAY: **Yes. Can we always add numbers in any order and get the same sum? Share your thinking with your Shoulder Partner and explain why you think so.**

 STUDENTS DO: Share thinking with a **Shoulder Partner** and explain why they think so.

TEACHER SAY: **Raise your hand to share your ideas.**

 STUDENTS DO: Raise hand to volunteer. Selected students share ideas.

Note to the Teacher: Ensure students share their thinking, but make sure they ultimately understand that addends can be added in any order to get the same product.

TEACHER SAY: Excellent thinking. Addends can be in any order. When we add them together, we will get the same sum, or answer. This is called the Commutative Property of Addition. Please say this with me as I write it on the board. (Write term on the board.)

STUDENTS DO: Say, "Commutative Property of Addition."



Learn (35 to 45 minutes)

Directions

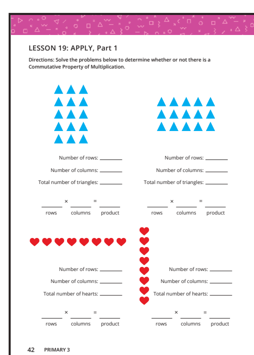
1. **TEACHER SAY: How many of you predict multiplication also has a Commutative Property? I want to take a tally of your predictions. If you think that the order of the numbers in a multiplication problem matters, raise your hand.**

STUDENTS DO: Raise hand if they think the order of numbers in a multiplication problem matters.

TEACHER DO: Make a tally chart showing how many students predict that multiplication does not have a Commutative Property.

TEACHER SAY: If you think that the order of the numbers in a multiplication problem does not matter, raise your hand.

TEACHER DO: Make a tally chart showing how many students predict that multiplication does have a Commutative Property.



LESSON 19: APPLY, Part 1

Directions: Solve the problems below to determine whether or not there is a Commutative Property of Multiplication.

Number of rows: ____
Number of columns: ____
Total number of triangles: ____

____ × ____ = ____
rows columns product

Number of rows: ____
Number of columns: ____
Total number of triangles: ____

____ × ____ = ____
rows columns product

Number of rows: ____
Number of columns: ____
Total number of hearts: ____

____ × ____ = ____
rows columns product

Number of rows: ____
Number of columns: ____
Total number of hearts: ____

____ × ____ = ____
rows columns product

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2. **TEACHER SAY: Now let's find out. Please open your student book to page Lesson 19: Apply, Part 1.**

STUDENTS DO: Open student book to page Lesson 19: Apply, Part 1.

TEACHER SAY: You will see several problems to solve. As you work, keep our question in mind: Does multiplication have a Commutative Property? In other words, can the numbers in a multiplication problem be in any order and still give the same product?

TEACHER DO: Read the directions aloud to students.

STUDENTS DO: Ask questions about the directions, if needed. Complete work independently in student book.

TEACHER DO: Observe students as they work. Listen for the "ah-ha" moments as students realize there is a Commutative Property for Multiplication. After several minutes (depending on how quickly students work), use an **Attention Getting Signal** to bring the group back together.

3. **TEACHER SAY: Now please turn to your Shoulder Partner and share what you noticed. Does multiplication have a Commutative Property? Explain how you know.**

STUDENTS DO: Discuss with **Shoulder Partner** whether or not multiplication has a Commutative Property and how they know.

TEACHER SAY: Let's share what we noticed. How many of you think that multiplication does NOT have a Commutative Property? I want to hear your thinking.

STUDENTS DO: Raise a hand to indicate they do NOT think multiplication has a Commutative Property. Explain thinking.

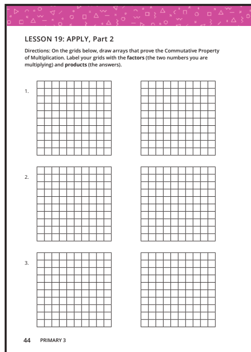
TEACHER DO: Permit students to ask questions of each other and respond to each other.

TEACHER SAY: How many of you think that multiplication DOES have a Commutative Property? I want to hear your thinking.



STUDENTS DO: Raise a hand to indicate they DO think multiplication has a Commutative Property. Explain thinking.

TEACHER DO: Permit students to ask questions of each other and respond to each other.



LESSON 19: APPLY, Part 2

Directions: On the grids below, draw arrays that prove the Commutative Property of Multiplication. Label your grids with the **factors** (the two numbers you are multiplying) and **products** (the answers).

1.

2.

3.

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4. TEACHER SAY: Now we know that both multiplication and addition have a Commutative Property. This means that we can add the addends or multiply the FACTORS in any order and get the same answer. Turn to page Lesson 19: Apply, Part 2 in your book.



STUDENTS DO: Turn to Part 2 in the student book.

TEACHER SAY: In your book, you will see a lot of grids. Your challenge is work on your own or with a Shoulder Partner to create arrays modeling the Commutative Property of Multiplication. Create examples showing how the property works. You can use any factors—or numbers—that you want and that will fit on the grids. Let's see if you understand the directions. I choose to create an array with 3 rows and 6 columns. I draw and color that array in the first grid in my book. What do I need to draw and color in the second grid? Raise your hand if you know.



STUDENTS DO: Raise a hand if they know. Selected students share thinking.

TEACHER DO: Make sure students understand they should draw an array with 6 rows and 3 columns in the second grid to prove the Commutative Property.

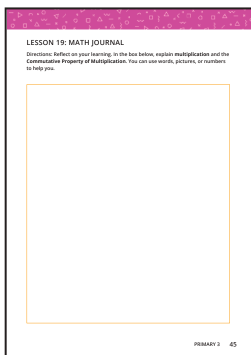


STUDENTS DO: Decide whether they will work alone or with a partner. Spend the rest of Learn time proving the Commutative Property with arrays.



Reflect (5 to 10 minutes)

Directions



LESSON 19: MATH JOURNAL

Directions: Reflect on your learning. In the box below, explain **multiplication** and the **Commutative Property of Multiplication**. You can use words, pictures, or numbers to help you.

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1. TEACHER SAY: You have done amazing work so far with multiplication. We are going to wrap up today's lesson using our books one more time. Find the page Lesson 19: Math Journal. In your own words, explain multiplication and the Commutative Property. You can use pictures, words, or numbers as part of your explanation.



STUDENTS DO: Explain multiplication and Commutative Property independently.

TEACHER DO: Give students time to write. If time allows, call on a few to share what they wrote.



STUDENTS DO: Selected students share explanations with the class.

Lesson 20 Overview

LESSON OVERVIEW

In this lesson, students play Array Blocks, a game that they initially learned in Primary 2 but only played with repeated addition. This learning activity helps students strengthen and apply their understanding of the relationship between repeated addition and multiplication and model multiplication using arrays. Some students may need repeated opportunities to explore and discuss these relationships to build deep understanding. If possible, allow students to help each other and support each other's learning.

LEARNING OBJECTIVES

Students will:

- Solve multiplication problems using arrays.
- Think strategically to solve a mathematical problem.
- Use arrays to solve a real-world problem.

KEY VOCABULARY

- Array
- Column
- Product
- Row

MATERIALS

- Colored pencils, crayons, or markers
- Two large versions of the 10 × 10 Array Blocks Game Board
- Six-sided die (one die for each pair of students)
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Print two 10 × 10 Array Blocks Game Boards (see the Array Blocks Game Board Blackline Master) or create two large 10 × 10 grids on the board.
- Gather six-sided dice (one die for each pair of students).
- Have available coloring tools for students.



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: **We have been working with arrays and equal groups in math, and today I have a question, but first I will need six volunteers. I will use Calling Sticks to choose volunteers. When your name is called, come to the front and line up in a straight line facing the class.**

TEACHER DO: Use Calling Sticks to choose six students.

 STUDENTS DO: Selected students go to the front and stand in a straight line.

TEACHER SAY: **These six students are all facing you. They are in one row, and there are six students in the row. This is an array. I can write the equation 1 × 6 to represent this array. One row with six objects—students—in the row. The product of 1 × 6 is 6.**

TEACHER DO: Record 1 × 6 = 6 on the board.

2. TEACHER SAY: **Now what if I wanted to rearrange these six students into a different array? Remember we have to create equal groups in order for it to be an array. Turn to your Shoulder Partner and discuss other ways that the students standing could be arranged. I will choose six new students.**

TEACHER DO: Give students Wait Time. Choose six new students using Calling Sticks.

 STUDENTS DO: Talk to partners.

TEACHER SAY: **Give a Thumbs Up if you would like to share the way you would arrange the six new students into a new array.**



STUDENTS DO: Give a **Thumbs Up** to share new arrangement of students. Selected students go to the front and move the students into a new array.

TEACHER DO: After students share their ideas and move students, ask volunteers to record the multiplication fact that goes with the new array.



STUDENTS DO: Selected students write the new array equation on the board.

TEACHER DO: Further exploration of the Commutative Property will be in future lessons, so for now do not have a discussion about this property. Continue until you have all the arrangements for 6.

TEACHER SAY: Wow, there are lots of ways to arrange six students into equal groups or arrays. All of the arrays you created had rows with the same amount in each row. We can write a multiplication equation for each array—number of rows multiplied by the number of students in each row.



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Display the two large versions of 10 × 10 grid paper on the board.

TEACHER SAY: Good work creating different arrays for six students. Now we are going to work some more with arrays and revisit a game you played in Primary 2 called Array Blocks. This year we are going to add a new layer of challenge with multiplication.

I am going to need a volunteer to help model this game. Raise your hand if you would like to come up and model the steps.



STUDENTS DO: Raise a hand to volunteer. Selected student helps the teacher model game play.

TEACHER DO: Select a student who you think has a good understanding of arrays.

TEACHER SAY: In Array Blocks, each player has their own grid paper. Player 1 rolls the die. The number rolled equals the number of rows. Player 1 rolls again. That number equals the number of columns—or the number of squares in each row. Let me show you with my first roll.

TEACHER DO: Write Rows: _____ and Columns: _____ on the board. Roll the die. Record the number of rows on the line. Roll again and record the new number as the number of columns. Then write the two numbers in a multiplication equation. (For example, if you rolled 3 and 4, you would write 3 × 4.)

Note to the Teacher: This example imagines that you have rolled a 3 and a 4. Please substitute those numbers and your sample array for the numbers you roll.

TEACHER SAY: Remember that I can use the multiplication symbol to show that I will have 3 rows times 4 in each row (or columns). Now I decide where I want to draw the array on my grid. Then I draw an array with 3 rows and 4 columns, color it lightly, and label it with the multiplication equation.

TEACHER DO: Draw array on the grid paper and lightly color. Write 3 × 4 inside the array. Be explicit in showing how the array you colored shows 3 × 4. Point to the rows and to the columns, or the number of squares in each row.

TEACHER SAY: Now that I have the array drawn and labeled with 3 × 4, I need to find the product. Remember, the product is the answer to a multiplication problem. How can we find the product of this multiplication equation? Raise your hand.



STUDENTS DO: Raise a hand to volunteer. Share how to find the product.

TEACHER SAY: **So we have 3 × 4 or 3 groups of 4. 4 + 4 + 4 = 12. There are 12 squares in this array. The product of 3 × 4 is 12. I will write that on the array.**

TEACHER DO: Record the equal sign and product.

TEACHER SAY: **Now it is my partner's turn. Roll two times and draw the array on your grid.**



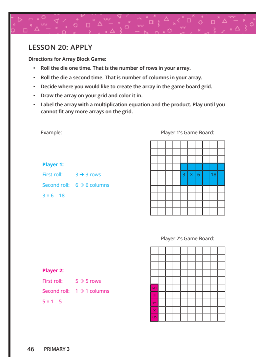
STUDENTS DO: Roll the die, record the number of rows and columns, and then draw, color, and label the array.

TEACHER DO: Repeat one more round of rolling and coloring in the array to model the game. Thank the student volunteer and have them return to their seat.

2. **TEACHER SAY:** **Good job. Now you are going to play the game the same way. Your goal is to fit as many arrays as you can and have the fewest number of blank squares left over. So you have to think very carefully where to place your arrays. When you can no longer make any arrays, you are done. When both players are finished, the game is over. Any questions?**



STUDENTS DO: Ask clarifying questions, if necessary.



LESSON 20: APPLY

Directions for Array Block Game:

- Roll the die one time. That is the number of rows in your array.
- Roll the die a second time. That is number of columns in your array.
- Decide where you would like to create the array in the game board grid.
- Draw the array on your grid and color it in.
- Label the array with a multiplication equation and the product. Play until you cannot fit any more arrays on the grid.

Example:

Player 1's Game Board:

Player 1:
First roll: 3 → 3 rows
Second roll: 6 → 6 columns
3 × 6 = 18

Player 2's Game Board:

Player 2:
First roll: 5 → 5 rows
Second roll: 1 → 1 columns
5 × 1 = 5

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TEACHER SAY: **Open your student book to page Lesson 20: Apply. There is a sample game on the first page to help you remember how to play. On the next page, you will see a blank grid. That is the first game board. This is where you draw and label your arrays. Let's use Hands Up, Pair Up to find partners. (Review the strategy Hands Up, Pair Up if necessary). Once you have a partner, come and get one die and find a place to play. There are two grids in your student book so you can play twice. If you finish both, try the Challenge problem in your book.**



STUDENTS DO: Use **Hands Up, Pair Up** to find a partner. Move to sit with partner and play Array Blocks. Create arrays based on die rolls. Draw, color, and label their arrays. When time is over, put away materials.

TEACHER DO: Monitor the groups as they play, assisting as needed. Direct students where to place materials at the end of the Learn segment.



Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: On the board, draw the following arrays:

STAGE			
XXXXXX	XXX XXX	XX XX XX	X X X X X X

TEACHER SAY: On the board are four different arrays. These are the arrays we created in Connect. If these arrays were students watching a performance, which arrangement do you think would be the best? Think for a moment and then turn and share with your Shoulder Partner. Share why you chose the array and what makes it the best way to arrange six students to see a performance. Give a Thumbs Up if you would like to share with the class.

TEACHER DO: Allow students 1 to 2 minutes to share with **Shoulder Partner** and then call on one to three students with **Thumbs Up** to share with the larger group.



STUDENTS DO: Share thinking with a **Shoulder Partner**. Give a **Thumbs Up** to volunteer. Selected students share thinking and explanations with the class.

TEACHER SAY: Nice work. I learned so much listening to you explain which array you think would be best. Thinking like a mathematician involves constructing a viable argument—or a good reason—why you think a certain answer or solution is correct. There might not be only one correct answer or strategy, so this year we will often need to explain our thinking and our reasoning.

PRIMARY 3

Mathematics

WHO AM I?

LIVING HEALTHY

Chapter 3

Lessons 21 to 30

Chapter 3: Lessons 21 to 30

Chapter Overview:

In Chapter 3 of Primary 3 Mathematics, students deepen their understanding of multiplication, connect multiples of 5 with telling time, begin to explore situations where division can be expressed, and see relationships between multiplication and division. To build a deep understanding of mathematical concepts, students explore relationships between old and new content and look for patterns to help them make sense of challenging concepts.

In the first two lessons, students connect multiplication story problems and multiplication equations. They learn how to identify when story problems can best be solved with multiplication and begin to write multiplication story problems of their own. *(Note: The teacher does not read most problems to students unless this is needed in a specific classroom.)* In the next three lessons, students engage in multiplication fact practice. The goals for this section are for students to identify patterns in multiplication, identify strategies for solving math facts, and begin to develop fluency. In the next two lessons, students use the relationship between skip counting by 5s and the minute hand of the clock to begin to tell time to 5-minute intervals. In the remaining lessons of this chapter, students solve sharing and partitioning story problems and begin using the division symbol. Students identify connections between multiplication and division and, in particular, identify this relationship in fact families.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 21 to 30, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.a. Explain products of whole numbers.

1)For example, describe or represent 2 × 3 as the total number of objects in 2 groups of 3 objects each.

1.b. Explain quotients of whole numbers.

1)For example, describe or represent 24 ÷ 4 as the number of objects in each share when 24 objects are divided equally into 4 shares.

2)For example, describe or represent 24 ÷ 4 as a number of shares when 24 objects are partitioned into equal shares of 4 objects each.

3)For example, describe a context in which a number of shares or a number of groups can be expressed as 24 ÷ 4.

1.c. Multiply and divide within 100.

1.d. Use strategies to solve problems multiplication and division problems, including:

1)Manipulatives
2)Drawings
3)Arrays
4)The relationship between multiplication and division

2.a. Apply properties of operations as strategies to multiply and divide, including:

1)Commutative Property of Multiplication

2.b. Apply the relationship between multiplication and division to solve multiplication and division problems with one unknown.

D. MEASUREMENT AND DATA:

3.a. Tell and write exact time from analog and digital clocks.

Computational Thinking

Throughout Lessons 21 to 30, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

D. MEASUREMENT AND DATA:

4.b. Solve story problems and analyze data displayed on a line plot.

CH 3 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
21	Students will: • Use a variety of strategies to solve multiplication story problems. • Explain elements of multiplication story problems. • Record a multiplication equation to match a story problem.
22	Students will: • Skip count by 4s. • Match multiplication equations to story problems. • Write a multiplication story problem that matches a given equation.
23	Students will: • Explain the rules for multiplying by 0 and 1. • Identify common multiples of 2 and 3. • Predict common multiples of 2 and 3 greater than 120. • Use evidence to justify and explain mathematical thinking.
24	Students will: • Identify the multiples of 5 and 10. • Identify numerical patterns when multiplying by 5 and 10. • Explain the relationship between skip counting and multiplication facts.
25	Students will: • Explore the relationship between multiples of 2, 3, and 6. • **Model** the Commutative Property of Multiplication using arrays. • Identify factor pairs using arrays.
26	Students will: • Skip count by 5s. • Explain the relationship between skip counting by 5s and telling time to 5-minute increments. • Read and write time in 5-minute increments on an analog clock.
27	Students will: • Use a variety of strategies to tell time to 5-minute increments. • Analyze and correct an incorrect time.
28	Students will: • Use manipulatives to model division. • Explain the relationship between sharing equally and dividing. • Use a variety of strategies to solve sharing division problems.
29	Students will: • Use a variety of strategies to solve division problems. • Explain their thinking when solving division problems. • Discuss the importance of perseverance.

LESSON	INSTRUCTIONAL FOCUS
30	Students will: • Describe the relationship between factors and their product. • Use the division symbol. • Apply the relationship between multiplication and division to identify fact families. • Solve division problems with one unknown.

Chapter Preparation for Teacher

Note to the Teacher: Throughout this chapter, students will solve story problems. Please read story problems aloud to students if they struggle with reading them silently.

For Lesson 22:

- Create a skip counting anchor chart. The chart should include multiples of 2 through 20 and 3 through 30. There should be room to record the multiples of 4 to practice skip counting in Connect (and other multiples as you work with students on numbers 5 through 10). An example is shown below.

Skip Counting by Multiples

2: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

4:

5:

6:

7:

8:

9:

10:

- Print one or more sets of the Multiplication Cards–1 Blackline Master.
  - Each student will need a multiplication equation card that matches another student's card.
  - In the event you have an odd number of students, use one of the blank cards to create a matching card for a group of three students.

For Lesson 23:

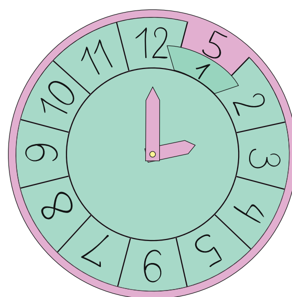
- Create and display a 120 Chart (a number chart that shows numbers 1 to 120, organized in rows of 10).
- Gather crayons or colored pencils.

For Lesson 25:

- Print and cut out the Arranging Chairs Game Cards (see the Blackline Master). You will need one or two number cards for each small group of students.
  - Each student group starts with one number, but as they finish, they will get another number or swap with another team.
- Tape four sheets of grid paper together to create a large grid. Have at least one large grid available for each group of 4 students. See the Array Grid Blackline Master.
- Have construction paper, crayons or colored pencils, glue (or glue sticks), and scissors available.

For Lesson 26:

- Make a large class clock model with moving hands.
    - Create a clock face out of a paper plate, cardboard, or any stiff material. It helps to make the hour and minute hand different colors to aid students when modeling. You can add the flaps to help students see the multiples of 5. An example is shown below.
        - Do not point out the minutes behind the flaps until after this lesson is complete since students work to discover that in this lesson.



        - Alternatively, see the Analog Clock Face–Large Blackline Master.
    - Create a large version of the image below.



For Lesson 27:

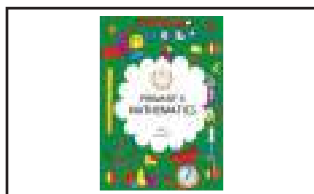
- Print and cut out a set of number cards 1 to 11 (one set per pair of students). See the Number Cards 1–12 Blackline Master. (Students will not need the 12 card for today's lesson.)

For Lesson 28:

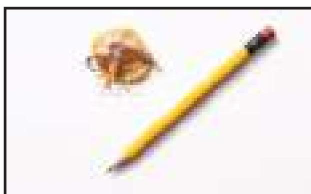
- Prepare sets of 50 counters (one set for the teacher and one set per pair of students).
    - The following items can be used if manipulatives are not available: dried beans, small pebbles, two-sided counters, connecting cubes, or unit cubes.
- Display Thinking Like a Mathematician anchor chart (if it is not already displayed).

Materials Used

Student book



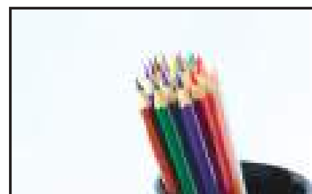
Pencil



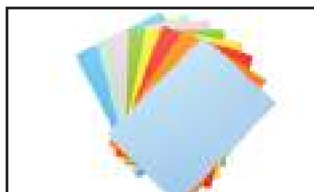
Crayons



Colored pencils



Construction paper



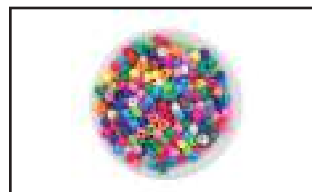
Glue



Scissors



Counters



Counting anchor chart

120 Chart

Multiplication cards

Lesson 21 Overview

LESSON OVERVIEW

Students begin by comparing addition and multiplication story problems. Then they use a strategy that makes sense for them (skip counting, drawing pictures, or using repeated addition, for example) to solve other multiplication story problems. There will be situations in which a story problem requires multiplication but does not contain the words "equal groups" or "in each group." Therefore, do not yet discuss those kinds of key words with students. Instead, continue to emphasize the relationship between arrays and multiplication and that multiplication involves groups of equal objects. Students will continue to explore this concept through practice, discussion of commonalities in multiplication stories, and review of the meaning of multiplication.

LEARNING OBJECTIVES

Students will:
- Use a variety of strategies to solve multiplication story problems.
- Explain elements of multiplication story problems.
- Record a multiplication equation to match a story problem.

LESSON PREPARATION FOR THE TEACHER

Write the following story problems on the board:

- Amir went to the store and bought 5 figs. When he got home, his mom gave him 3 more figs. How many figs did Amir have in all?
- Amir went to the store. He filled 3 bags with figs. Each bag had 5 figs in it. How many figs did Amir have in all?

KEY VOCABULARY

- Each
- Equal groups
- Equation
- Multiplication
- Product

MATERIALS

- Multiplication Cards–1
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Direct students' attention to the story problems on the board. Read the problems aloud.

TEACHER SAY: Turn to your Shoulder Partner and discuss how these problems are the same and how they are different. I will call on some of you to share your thinking.



STUDENTS DO: Talk to **Shoulder Partner** and compare the two story problems. Selected students share answers to the initial question and any other ideas that arise during the discussion.

TEACHER DO: Ask probing questions such as:
- Do both of these problems have the same answer? How do you know?
- How might you solve each of these problems? (Challenge students to identify the first problem as an addition task and the second as a multiplication task.)
- What information in the problems helps you decide how to solve each problem?

TEACHER SAY: Both of these problems ask for a total—the total number of figs that Amir has. In the first problem, Amir bought some figs and then added some more figs. It is an addition problem. In the second problem, Amir filled up 3 bags with the same number of figs in each bag. In this second problem, we had 3 groups (bags) and equal objects in each bag (5 figs). That reminds me of multiplication. Remember, multiplication is equal groups with an equal number of objects in each group. Lean and Whisper the answer to each of these problems.



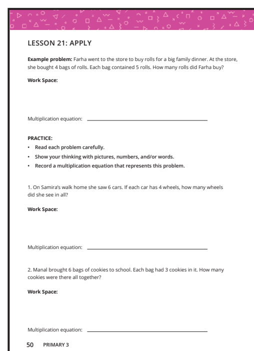
STUDENTS DO: Lean and Whisper the answers.

TEACHER SAY: Good work. It is important when solving story problems that we understand what is being asked so we can solve the problem correctly.



Learn (35 to 45 minutes)

Directions



LESSON 21: APPLY

Example problem: Farha went to the store to buy rolls for a big family dinner. At the store, she bought 4 bags of rolls. Each bag contained 5 rolls. How many rolls did Farha buy?

Work Space:

Multiplication equation: ______________________

PRACTICE:

- **Read each problem carefully.**
- **Show your thinking with pictures, numbers, and/or words.**
- **Record a multiplication equation that represents this problem.**

1. On Samira's walk home she saw 6 cars. If each car has 4 wheels, how many wheels did she see in all?

Work Space:

Multiplication equation: ______________________

2. Manal brought 6 bags of cookies to school. Each bag had 3 cookies in it. How many cookies were there all together?

Work Space:

Multiplication equation: ______________________

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1.TEACHER SAY: Let's look at some more story problems. Take out your Mathematics Student Book and turn to page Lesson 21: Apply.



STUDENTS DO: Take out student book and turn to correct page.

TEACHER SAY: In your book, you have an example problem. I will read it aloud while you read it to yourselves. When I am finished, Lean and Whisper to your Shoulder Partner what the problem is asking and how you would solve the problem.

Farha went to the store to buy rolls for a big family dinner. At the store, she bought 4 bags of rolls. Each bag contained 5 rolls. How many rolls did Farha buy?



STUDENTS DO: Read along with teacher. **Lean and Whisper** what the problem is asking and a strategy for solving.

TEACHER SAY: Let's hear from some of you about this problem and how you would solve it. As you share your thinking, I will record your strategy so others can learn from you. Give a Thumbs Up if you would like to share.



STUDENTS DO: Give **Thumbs Up** to volunteer. Selected students share thinking and strategies.

TEACHER DO: Record students' strategies on the board. Call on two or three students, asking for students who tried strategies different from those on the board. Try to identify different strategies.

Note to the Teacher: Students may draw pictures, use repeated addition, or use a multiplication fact. Seeing, using, and understanding a variety of strategies deepens understanding. When done sharing strategies, record "4 groups with 5 in each group, or 4 × 5 = 20" on the board.

TEACHER SAY: Most of you found that Farha had 20 rolls. Some of you counted by 5s, others drew pictures of the bags and the rolls, and some of you wrote 4 × 5 = 20 (or other strategies students used). What words in this problem might make some of you think that multiplication could be a strategy to solve? Raise your hand.



STUDENTS DO: Raise hand and share thinking.

TEACHER DO: If necessary, help students understand that the problem identifies multiple equal groups— 4 bags holding 5 rolls each.

TEACHER SAY: Often, when we have equal groups with equal items in each group, that gives us a clue that we can multiply to find the answer. Who remembers what we call the answer to a multiplication problem? Whisper it into your hand.



STUDENTS DO: **Whisper** the answer into their hands.

TEACHER SAY: The answer to a multiplication problem is the PRODUCT. Even if we used repeated addition to solve this problem, we can record it as a multiplication equation. On the board, I recorded a multiplication equation under our strategies. 4 groups with 5 in each group, or 4 × 5 = 20. Please record this in your student book if you have not already done so.

TEACHER DO: **Model** recording the multiplication equation.



STUDENTS DO: Record 4 × 5 = 20 in student book.

TEACHER SAY: Now you and a partner will solve the rest of the problems together. Show your strategy for solving the problem in the space below the story. You can solve these problems in whatever way works best for you, but you must record a multiplication equation and the product just like we did for the example.

TEACHER DO: Use **Calling Sticks** or another strategy to pair students. Walk around the class, observing students working together and the strategies they are using to solve the problems.



STUDENTS DO: Spend the rest of the Learn time reading and solving multiplication story problems with a partner. For each one, show the strategy used and record a multiplication equation and the product. If they finish early, they can work on the Challenge problems.

TEACHER SAY: **Nice work with multiplication story problems. Return to your seats and put away your materials.**



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY:** **Think about the story problems you solved today. What words in the problems helped you decide to solve them with multiplication? Please Turn and Talk with your Shoulder Partner about this question. Then I would like to hear from some of you.**



STUDENTS DO: Talk with a partner to discuss what words or how they knew that the situation might use multiplication. Selected students share ideas.

TEACHER DO: Listen and ask students deeper questions, such as:

- What words might be in an addition story problem that might not be in a multiplication story problem?
- Could you use both multiplication and addition to solve some of these problems? Why or why not?
- How do you decide how to solve a story problem? How do you choose a strategy?



STUDENTS DO: Selected students share ideas and answer the teacher's questions, if asked.

TEACHER DO: Take note of students who have a strong understanding of problem-solving strategies and students who may need additional practice and support. Thank students for sharing ideas.

Lesson 22 Overview

LESSON OVERVIEW

In today's lesson, students continue to explore multiplication from a variety of perspectives. They practice skip counting to help them develop strategies for solving multiplication problems. There are many patterns in multiples, and students will begin to notice these the more they practice. Students analyze story problems to identify matching equations. Allow students to make mistakes and analyze their errors. When students correct themselves or each other, they learn even more. Finally, students begin to write original multiplication stories. This will help you assess whether or not students understand the importance of equal groups in multiplication problems. You can differentiate for students by giving them factors that align with individual skill sets.

LEARNING OBJECTIVES

Students will:

- Skip count by 4s.
- Match multiplication equations to story problems.
- Write a multiplication story problem that matches a given equation.

LESSON PREPARATION FOR THE TEACHER

- Print and cut sets of Multiplication Cards–1 Blackline Master. See Chapter Preparation for Lesson 22 for additional information.
- Create and display a skip counting anchor chart. See Chapter Preparation for Lesson 22 for details and an example.

KEY VOCABULARY

- Equation
- Multiples
- Product
- Skip count

MATERIALS

- Skip counting anchor chart
- Sets of Multiplication Cards–1
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.**TEACHER DO:** Post skip counting anchor chart on board with 2s and 3s recorded.

TEACHER SAY: We have practiced skip counting by 2s and 3s, so I created a chart that shows the numbers we counted. To start math today, we will count by 4s. Today we will add the MULTIPLES of 4.

We do this just like we did for the 3s. When I say start, we begin whisper counting. We whisper three numbers then say the fourth out loud and clap. I record the numbers we say aloud—the MULTIPLES of 4—on the board. We continue by whispering three numbers, then clapping and saying aloud the fourth number like this:

TEACHER DO: **Model** how to whisper 1, 2, 3, and then clap and say 4. **Whisper** 5, 6, 7, and then clap and say 8, and so on.

TEACHER SAY: Remember that it was tricky to do with 3s, but we stuck with it. We are thinking like mathematicians and working through challenges. Ready to try?

TEACHER DO: (Point to Thinking Like a Mathematician anchor chart). Count with students and record on the board the multiples of 4 up to 40. If time allows, do more than once.



STUDENTS DO: Count up to 40, clapping on each multiple of 4 and whispering all the other numbers.

2.**TEACHER SAY: Good job working through challenges. Please look at the multiples, or all the numbers we just said when we counted by 4. Compare the multiples of 4 to the multiples of 2. Turn and talk to a Shoulder Partner for 1 minute to share what you notice. I will call on some of you to share your thinking.**



STUDENTS DO: Talk to a partner to compare the multiples of 2 and 4. Selected students share thinking with the class.

Note to the Teacher: If students do not notice that all the multiples of 4 are also part of the multiples of 2, point it out. Students may also notice that every other multiple of 2 is a multiple of 4.



Learn (35 to 45 minutes)

Directions

LESSON 22: APPLY

Directions: Read each story problem on your own. With a partner, match each story problem to its multiplication equation.

Part 1

Mariam had 4 sweaters. Each sweater had 3 buttons on it. How many total buttons are there on all the sweaters?	6 × 6 = 36
Rana packed 6 boxes full of cans. Each box had 6 cans. How many total cans did Rana pack?	3 × 7 = 21
Amir hiked for 3 days over the summer. Each day he hiked 7 miles. How many miles did he hike in all?	4 × 3 = 12

Part 2

Record your equation here: ______

Write a story problem that matches the equation above.

______

When you finish, find a partner with the same card. Work together to find the product.

Product: ______

How did you solve this problem? Show your work below:

PRIMARY 3 53

1.**TEACHER SAY: In our last math class, we solved story problems using multiplication. These stories had groups of things with equal amounts in each group. Please open your Mathematics Student Book to page Lesson 22: Apply and read the story problems and equations silently to yourself.**



STUDENTS DO: Open student book to page Lesson 22: Apply and read the story problems silently.

TEACHER DO: If needed, read the problems aloud to your class.

TEACHER SAY: Talk to your Shoulder Partner about the problems and work together to match them to the equations that you would use to solve the problems. When you and your partner are done, give me a Thumbs Up to show me you are ready.



STUDENTS DO: Work with a partner to match multiplication story problems and equations. Give a **Thumbs Up** when they are done.

TEACHER DO: Choose partners to pick a story problem and its matching equation. Ask students to explain how they selected answers. Repeat for the other two story problems. If students are incorrect, probe their thinking with questions such as, "Do the numbers match?" or "What is this problem asking us to do?" Allow students to correct each other, if needed.



STUDENTS DO: Selected partners share answers and explain thinking.

TEACHER SAY: Great job. Today you are going to try something even more challenging. You will write your own story problem and share it with a friend to see if they can solve it. What do you know about multiplication story problems? Raise your hand if you have an idea.



STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If no students mention that multiplication problems involve one or more equal groups, be sure to remind them and share examples.

TEACHER SAY: I like to hear your thinking in mathematics. Let's practice writing a multiplication story problem together first. I will write an equation on the board. It is not solved yet, so keep the product to yourself if you already know it.

TEACHER DO: Write 3 × 6 = ______ on the board.

TEACHER SAY: I am going to Think Aloud how I would write a story problem for this multiplication equation. Listen as I model so you have an idea how to do the same thing on your own.

TEACHER DO: Do a **Think Aloud** to walk through a simple story to go with 3 × 6. Write the story on the board so students can see as you are describing your thinking. Be sure to emphasize that you must create a problem involving multiple equal groups. A **Think Aloud** example follows:

"I know that with multiplication, I have groups of things. I am going to have 3 groups in my story and 6 things in each group. I think I will be picking flowers for some friends. So my story could be,

'Sara picked flowers for 3 friends. She wanted to give each friend a bouquet with 6 flowers in it. How many flowers will Sara need for all of the bouquets?'

I have 3 friends and each friend gets a bouquet, so I need 3 groups of flowers. Each group has 6 flowers in it."



STUDENTS DO: Listen to the teacher do a **Think Aloud**.

TEACHER SAY: **Now that my story problems is finished, give me a Thumbs Up if you think my story problem matches the equation 3 × 6. Be prepared to explain why.**



STUDENTS DO: Give a **Thumbs Up** if they think the story problem and equation match. Selected students explain reasoning.

TEACHER SAY: **Good. This story does match the equation because I have 3 groups of 6 things. Now it is your turn to write your own story problem. I am going to give you a card with a multiplication equation. The product is not written.**

TEACHER DO: Hand out the Multiplication Cards. There are different equations so you can differentiate for students based on current ability. Make sure that every equation has at least two students writing a story problem for it.

Note to the Teacher: If you have a small class, you can have everyone work on the same equation at the same time and share and compare story problems with the whole group.

TEACHER SAY: **Now that you have an equation card, write your own story problem on the lines. When you are done, find a friend who has the same equation card and compare stories. Then work together to solve your equation. Are there any questions?**



STUDENTS DO: Ask any clarifying questions and then begin writing story problems. When finished, find a partner who has the same equation and compare stories. Work together to solve.

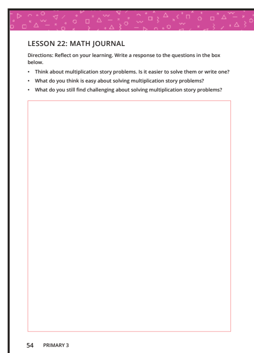
TEACHER DO: Walk around the class offering assistance in writing story problems and in helping students find others to compare stories. If students finish writing, comparing, and solving, they can get a new card and work with a partner to write a new story problem.

TEACHER SAY: **Great work today. Return to your seat with your student book for Reflect.**



Reflect (5 to 10 minutes)

Directions



LESSON 22: MATH JOURNAL

Directions: Reflect on your learning. Write a response to the questions in the box below.

- Think about multiplication story problems. Is it easier to solve them or write one?
- What do you think is easy about solving multiplication story problems?
- What do you still find challenging about solving multiplication story problems?

54 PRIMARY 3

1. TEACHER SAY: **For the past two math classes, we have worked with story problems. We solved some using different strategies and we wrote some. Reflect on your learning. Is it easier to solve story problems or to write them? What is easy for you? What is still challenging for you? Record your thinking to these questions on page Lesson 22: Math Journal.**



STUDENTS DO: Spend 2 to 3 minutes responding to the questions.

TEACHER DO: Be sure to review students' entries at a later time. They will provide valuable information about students' learning.

TEACHER SAY: **Everyone worked so hard today. For the next few classes, we will work on multiplication math facts that will make solving story problems even easier. Give yourself a pat on the back.**



STUDENTS DO: Pat themselves on the back.

Lesson 23 Overview

LESSON OVERVIEW

In this lesson, students practice multiplying by 0 and 1 and explain why it is easy to remember these multiplication facts. All students will need to articulate that when multiplying by 0, there are 0 groups, therefore a product of 0. Also, when multiplying by 1, there is only 1 group, so the product is the number of items in that group. To support students' use of patterns to build mathematical understanding and to develop computational thinking skills, students will find patterns with multiples of 2 and 3 on the 120 Chart. Be sure to connect this practice to multiplication problem-solving strategies.

LEARNING OBJECTIVES

Students will:
- Explain the rules for multiplying by 0 and 1.
- Identify common multiples of 2 and 3.
- Predict common multiples of 2 and 3 greater than 120.
- Use evidence to justify and explain mathematical thinking.

LESSON PREPARATION FOR THE TEACHER

- Create and display a 120 Chart (a number chart that shows numbers 1 to 120, organized in rows of 10).
- Gather crayons or colored pencils.

KEY VOCABULARY

- Multiples
- Product

MATERIALS

- 120 Chart
- Crayons or colored pencils
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Display 120 Chart.

TEACHER SAY: In Primary 2, we spent a lot of time working on our addition and subtraction math facts. You may have discovered that some facts are easier than others to remember. So we practiced strategies to help us: plus 10 facts, doubles, doubles plus or minus one, and so on. In multiplication, there are also math facts and strategies to help us remember them. Today we will identify some multiplication math facts that are easy to remember.

TEACHER DO: Write the following on the board:
8 + 0 is the same as 8 × 0.
8 + 1 is the same as 8 × 1.

TEACHER SAY: Someone told me that 8 × 0 = 8 since 8 + 0 = 8. They also said that 8 × 1 = 9 because 8 + 1 = 9. Give a Thumbs Up if you agree with this thinking. Give me a thumbs down if you disagree.

 **STUDENTS DO:** Use **Thumbs Up** to indicate answers.

TEACHER DO: Call on students with different responses to share thinking.

TEACHER SAY: When we multiply by 0, we have 0 groups, or 0 things in each group, so 8 multiplied by 0 is 0 because I have 0 groups of 8. Anything multiplied by 0 is 0. If I multiply a number by 1, I have only one group of that number, so 8 multiplied by 1 is 8 because I have 1 group of 8. Any number multiplied by 1 is the number being multiplied. Let's quickly practice some 0 and 1 facts. Whisper the products to the math facts I say.

TEACHER DO: Give students 0 and 1 multiplication facts to practice. Include some large numbers too (for example, 253 × 1 or 0 × 7,498) to ensure that students understand that no calculation is needed when multiplying by 0 or 1.


STUDENTS DO: **Whisper** the products to themselves.



Learn (35 to 45 minutes)

Directions

1.TEACHER SAY: Today you are going to use a 120 Chart to practice finding multiples of numbers. The multiples are the same numbers you would say when skip counting. (Refer to the skip counting anchor chart.) If we are looking for the multiples of 2, we start on number 2. The first multiple of 2 on our 120 Chart is 2, because 2 × 1 = 2. If our chart had 0, we could start at 0 because 2 × 0 = 0.

Please open your Mathematics Student Book to page Lesson 23: Apply to see your 120 Chart. Put your finger on the 2.


STUDENTS DO: Put fingers on the 2 on the 120 Chart.

TEACHER DO: Decide what two colors students will use to color 120 Charts (for example, yellow and green). Have students take out those colors (crayons or colored pencils).


STUDENTS DO: Take out coloring tools as directed.

TEACHER SAY: From 2 you would skip to 4, 6, 8, 10, and so on. You can always check your work by practicing the Whisper strategy we have used, by looking at our skip counting chart, or by using repeated addition. Color all of the multiples of 2 on your 120 Chart _____ (color). Color lightly so you can still see the number underneath. Let's do the first 10 multiples of 2 together.

TEACHER DO: **Model** lightly coloring in the first 10 multiples on the chart as the students follow along.


STUDENTS DO: Color in the first 10 multiples with the teacher.

TEACHER SAY: Now that we have done some together, please color the rest of the multiples of 2 on your own. As you work, pay attention to any patterns you notice that makes coloring or counting by 2 easier. When you are done, practice counting by 2 all the way to 120, or beyond, to yourself. Begin coloring.


STUDENTS DO: Color in the rest of the multiples of 2. When done, quietly count the multiples of 2 to 120.

TEACHER DO: After approximately 3 to 5 minutes (or sooner if most students are done), bring students' attention back using an **Attention Getting Signal**.

TEACHER SAY: If you noticed a pattern you can share, please raise your hand. Let's hear from a few of you.


STUDENTS DO: Raise hand to volunteer. Selected students describe the patterns they identified.

Note to the Teacher: Students should notice the columns that were colored, that every other number was colored, and that all the numbers that they colored are even. They may note the opposite patterns in the numbers they did not color. If students do not name these patterns, use questions to guide their thinking or explain them yourself.

TEACHER SAY: You are wonderful pattern finders, just like great mathematicians. Now we will color all of the multiples of 3_____ (a different color than the 2s). Remember, some of the multiples of 3 are written on our skip counting chart. So we can do the first ones together.

TEACHER DO: **Model** coloring in the first 10 multiples of 3 on the large chart. When you get to 6, discuss why it is already colored and make a plan as a class how to show both colors when a number is a multiple of both 2 and 3. Repeat the procedure for 12.

TEACHER SAY: **Now you will finish the multiples of 3 on your own. Use the Whisper counting strategy or our class chart to help you. When you have finished finding all the multiples of 3 on your 120 Chart, please use the chart to respond to the prompts below the chart.**



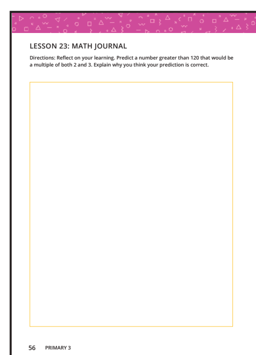
STUDENTS DO: Work independently to identify and color multiples of 3 to 120. Answer questions about the multiples of 2 and 3.

TEACHER DO: Walk around and assist students as needed.



Reflect (5 to 10 minutes)

Directions



LESSON 23: MATH JOURNAL

Directions: Reflect on your learning. Predict a number greater than 120 that would be a multiple of both 2 and 3. Explain why you think your prediction is correct.

56 PRIMARY 3

1. **TEACHER SAY:** **Excellent job looking for multiples on your 120 Chart. Reflect on the patterns you observed today and what you have learned. Can you predict a number greater than 120 that would be a multiple of both 2 and 3? Turn to page Lesson 23: Math Journal in your book and record your thinking.**



STUDENTS DO: Respond to the question in the math journal.

TEACHER DO: Give students 2 to 3 minutes to write predictions. Call on a few volunteers to share thinking. Encourage students to use the class 120 Chart to explain reasoning.



STUDENTS DO: Selected students share thinking and reasoning. Students may ask each other questions or provide support to each other.

Lesson 24 Overview

LESSON OVERVIEW

Students continue to use patterns to help them identify and remember multiplication facts and to explore the relationships between numbers with common multiples. In today's lesson, they find patterns in the multiples of 5 and 10. They also connect skip counting with corresponding multiplication equations.

LESSON PREPARATION FOR THE TEACHER

No new preparation needed.

LEARNING OBJECTIVES

Students will:

- Identify the multiples of 5 and 10.
- Identify numerical patterns when multiplying by 5 and 10.
- Explain the relationship between skip counting and multiplication facts.

KEY VOCABULARY

- Equation
- Factors
- Multiples
- Pattern

MATERIALS

- Class 120 Chart
- Crayons or colored pencils
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER SAY: **Let's start today counting by 10s. We will go quickly. While you count, I will point to our 120 Chart.**

 STUDENTS DO: Count aloud by 10s to 120 with the teacher.

TEACHER SAY: **Talk to your Shoulder Partner for 1 minute to share what patterns you noticed when we said the multiples of 10. After a minute, I will use Calling Sticks to hear from two people about what you noticed.**

 STUDENTS DO: Talk to a **Shoulder Partner** about patterns they identified. Selected students share observations.

Note to the Teacher: Students should notice that when skip counting by 10s, the multiples appear in one column on the 120 Chart all the way to the right and that each multiple ends in a 0. If students do not share this, explain it to them.

TEACHER SAY: **Let's do the same thing with multiples of 5. You say them and I will point to our class chart. Then we will talk about patterns you observed.**

 STUDENTS DO: Count aloud by 5s to 120 with the teacher.

TEACHER SAY: **Talk to your Shoulder Partner for 1 minute to share what patterns you noticed when we said the multiples of 5. After a minute, I will use Calling Sticks to hear from two people about what you noticed.**

 STUDENTS DO: Talk to a **Shoulder Partner** about patterns they identified. Selected students share observations.

Note to the Teacher: Students should notice that when skip counting by 5s, the multiples appear in two columns on the 120 Chart and that each multiple ends in either a 5 or a 0. If students do not share this, explain it to them.



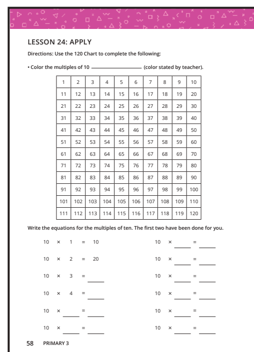
Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today we are going to continue our exploration of multiples on the 120 Chart. We will add one more part to our work, though. We will identify the MULTIPLES on our chart and then we will write multiplication equations to match. Each multiplication equation will have two FACTORS and a PRODUCT. Whisper to your Shoulder Partner what a factor and product are.

 **STUDENTS DO: Whisper** to **Shoulder Partner** definitions of factor and product.

TEACHER SAY: I heard many of you remember that the PRODUCT is the answer in a multiplication equation and that the FACTORS are the two numbers that are multiplied together. Great job.



LESSON 24: APPLY

Directions: Use the 120 Chart to complete the following:

• Color the multiples of 10 ______________ (color stated by teacher).

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Write the equations for the multiples of ten. The first two have been done for you.

10 × 1 = 10   10 × ___ = ___

10 × 2 = 20   10 × ___ = ___

10 × 3 = ___   10 × ___ = ___

10 × 4 = ___   10 × ___ = ___

10 × ___ = ___   10 × ___ = ___

10 × ___ = ___   10 × ___ = ___

58 PRIMARY 3

TEACHER DO: As in Lesson 23, choose two colors students will use to color the 120 Chart in the student book. Have students take out those two crayons.

TEACHER SAY: Take out your crayons and your Mathematics Student Book. Turn to page Lesson 24: Apply.

 **STUDENTS DO:** Take out two crayons and the student book. Turn to the correct page.

TEACHER SAY: Now watch as I model what you will do. First, we will find the multiples of 10. We will color the multiples of 10 _____ (color). Please whisper the first two multiples of 10 again.

 **STUDENTS DO: Whisper** the first two multiples of 10.

TEACHER DO: Color (or lightly shade) the numbers on the 120 Chart.

TEACHER SAY: Thank you for helping me. Now you color the first two multiples of 10 in your book.

 **STUDENTS DO:** Color 10 and 20 on the 120 Chart.

TEACHER SAY: Now we want to write the equation for these multiples of 10. Since we are counting by 10, our first factor will be 10. I started by having 10 one time, so our second factor is 1. Who can come up and write the equation for factors 10 and 1? Raise your hand.

 **STUDENTS DO:** Raise hand to volunteer. Selected student records the equation 10 × 1 = 10 on the board (and may ask for help from friends, if needed).

TEACHER SAY: Who can help me with the second equation? Raise your hand.

 **STUDENTS DO:** Raise hand to volunteer. Selected student identifies the two factors in the equation and records 10 × 2 = 20 on the board, asking for help as needed.

TEACHER DO: Make sure all students understand how the factors and the product are determined. If necessary, complete 10 × 3 with students.

TEACHER SAY: Now you will continue counting by 10, coloring the multiples of 10 on your own 120 Chart. When you finish this step, write the equations for each colored box. What questions do you have before you begin?

 **STUDENTS DO:** Ask questions if needed to clarify the task. Begin working independently on the task.

TEACHER DO: Monitor students as they work, assigning them to work with partners if extra support is needed. When most students have finished, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: I want to know how this work went for you. Please be honest so I can help you if you need help. Listen carefully. When I say go, do the following: If it was easy and you feel great, jump up. If it was okay, put your hands on your desk. If it was challenging, put your hands on the floor.

 **STUDENTS DO:** Move bodies to reflect how this work went for them.

TEACHER SAY: Thank you for being honest. I know who I will help in this next round. You will do the same task with multiples of 5.

Note to the Teacher: If space permits, call over the students who put their hands on the floor to an area to work with you or each other.

TEACHER SAY: You have the choice to do the multiples of 5 on your own or with a partner. Please color all of the multiples of 5 _____ (a different color than was used for multiples of 10). Then record all the equations for the multiples of 5.



Reflect (5 to 10 minutes)

Directions

1.TEACHER SAY: Today you skip counted by 10s and 5s on a 120 Chart and colored in the numbers you counted. Then you recorded the multiplication facts for 10 and 5 up to 120. What relationship did you see between the numbers colored in on the 120 Chart and the multiplication facts you wrote down? Think for a moment, then raise your hand when you have an idea you would like to share.

 **STUDENTS DO:** Think quietly about the relationship between skip counting and multiplication facts. Raise hand to volunteer. Selected students share thinking, using the 120 Chart as needed to illustrate.

TEACHER DO: Listen carefully to students' explanations. Offer clarifying statements as needed but allow students to explain and justify their own thinking. It is important for students to make this connection and to use patterns, so they understand that multiplication facts are not random or unpredictable.

TEACHER SAY: What wonderful mathematical thinking I have heard today. I am very impressed by how you explain yourselves and help each other. Great job today using the 120 Chart as a tool to help you solve multiplication problems. Give yourself a big hug.

 **STUDENTS DO:** Give themselves a hug.

Lesson 25 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students create arrays for a game called Arranging Chairs. They use the Commutative Property of Multiplication and find all factor pairs for a given product. To launch the lesson, students identify the multiples of 6 and their relationship to the factors 2 and 3.	Students will: • Explore the relationship between multiples of 2, 3, and 6. • **Model** the Commutative Property of Multiplication using arrays. • Identify factor pairs using arrays.	• Array • Commutative Property of Multiplication • Factor • Product

LESSON PREPARATION FOR THE TEACHER

- Create Arranging Chairs game cards for students. See Chapter Preparation for Lesson 25 for details.
- Have available large sheets of grid paper for each pair of students. (See the Array Grid Blackline Master). See Chapter Preparation for Lesson 25 for detailed instructions.
- Have construction paper, scissors, and glue (or glue sticks) available.

MATERIALS

- Arranging Chair game cards
- Grid paper (at least one large sheet for each group of 4 students)
- Construction paper
- Crayons or colored pencils
- Glue or glue sticks
- Scissors



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: **Give me a Thumbs Up if you can remind us what a multiple is.**



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share explanations. Answers may include: Multiples are skip counting numbers; the multiples of 2 are 2, 4, 6; and so on.

TEACHER SAY: **Thank you for sharing your learning. A MULTIPLE is the product when a number is multiplied a number of times. For example, multiples of 3 are 3, 6, and 9, which are 3 × 1, 3 × 2, and 3 × 3. We name them when we skip count. The other day a friend told me that if they color in the multiples of 6 that they would also be coloring in the multiples of 2 and 3. Look at our 120 Chart. Do you agree with my friend or not? Turn to your Shoulder Partner and discuss. I will use Calling Sticks to hear your thinking.**



STUDENTS DO: Turn and discuss with partner. Selected students share thinking, using the 120 Chart as needed to explain reasoning.

TEACHER SAY: **Interesting ideas. Raise your hand if you would like to come up and circle the first four multiples of 6 so we can see what happens.**



STUDENTS DO: Raise hand to volunteer. Selected student goes to the class 120 Chart and circles the first four multiples of 6. Student may ask for help from friends, if needed.

TEACHER SAY: **2 and 3 are factors of 6. Because they are factors of 6, 2 and 3 will share some multiples of 6. Knowing these kinds of patterns can help us learn and remember multiplication facts.**



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Draw the following arrays on the board. (This is the same image that was used in Reflect for Lesson 20.)

STAGE			
XXXXXX	XXX	XX	X
	XXX	XX	X
		XX	X
			X
			X
			X

TEACHER SAY: A few days ago, we looked at these arrays. Each of these arrays has a total of 6 chairs. Quickly turn to your Shoulder Partner and share which array you thought was the best chair arrangement for watching the performance.

 **STUDENTS DO:** Turn and share thinking with a **Shoulder Partner**.

TEACHER SAY: These arrays represent ways to multiply two whole numbers, or factors, to get a product of 6.

TEACHER DO: Describe and point to the following arrays:

- 1 row with 6 chairs $1 \times 6 = 6$
- 2 rows with 3 chairs $2 \times 3 = 6$
- 3 rows with 2 chairs $3 \times 2 = 6$
- 6 rows with 1 chair $6 \times 1 = 6$

2.TEACHER SAY: We discovered a few days ago that both addition and multiplication have a Commutative Property. Raise your hand if you can explain what the Commutative Property is.

 **STUDENTS DO:** Raise hand to volunteer. Selected students explain the property.

TEACHER DO: If students do not remember the Commutative Property, explain it to them.

TEACHER SAY: The Commutative Property means that we can add the addends or multiply the factors in any order and get the same answer. 1 and 6 are factors of 6, and 1 × 6 has the same product as 6 × 1.

Today we are going to play the Arranging Chairs game to solve some puzzling problems. I will give you a product, or total number of chairs. Your job will be to find all the ways to arrange those chairs into arrays. You will have graph paper to draw, color, and cut out each array you find.

TEACHER DO: Hold up a sheet of Array Grid paper.

TEACHER SAY: Before you start, let's do one more together. If we had 10 chairs, how many different arrays could we make? Turn and talk to your Shoulder Partner. Give me a Thumbs Up when you are ready to share. As you share your arrays, I will cut them out of this graph paper.

 **STUDENTS DO:** Talk to a **Shoulder Partner** about the possible arrays for 10 chairs. Give a **Thumbs Up** to volunteer. Selected students share work.

TEACHER DO: If possible, have student volunteers draw, color, and cut out arrays as they are shared and display them on the board. Otherwise, you draw, color, and cut the arrays. Make sure you have 2×5, 5×2, 1×10, and 10×1.

TEACHER SAY: On the board, we have four different arrangements of chairs. Are any of these arrangements the same shape? Raise your hand to explain.

 **STUDENTS DO:** Examine arrays on the board to determine if any are the same shape.

Note to the Teacher: Students should recognize that 2 × 5 and 5 × 2 (as well as 10 × 1 and 1 × 10) are the same shape, and therefore the same multiplication fact.

3. **TEACHER SAY: Yes, for 10 chairs there are only two sets of factors: 2 and 5, and 1 and 10. We can make four arrangements, but two of them look similar, just rotated.**

TEACHER DO: **Model** rotating 2 × 5 to show 5 × 2 and 1 × 10 to show 10 × 1.

TEACHER SAY: Today when you are thinking of the arrays, you may have some that are the same shape. They have the same factors, but are just rotated.

Now it is your turn. I will put you in small groups. One person from your group will come up and get a card with a total number of chairs, a large sheet of grid paper, a large piece of construction paper, glue, and scissors. You will take out crayons so you can color your arrays. You will work as a team to draw, color, and cut out all the arrays for the product on your card and glue them to your construction paper. Under each array, record the multiplication fact that it represents, such as 2 × 5 = 10 or 1 × 10 = 10.

If you need another sheet of construction paper, come up and get a new one. Then trade cards with another team who is also done and work on the new product. What questions do you have?

 **STUDENTS DO:** Ask questions to clarify directions, if necessary.

TEACHER DO: Arrange students into groups of 4.

 **STUDENTS DO:** Move to sit with group. One person from each group gets supplies. Spend the rest of the Learn time identifying and creating arrays for a variety of products.

TEACHER DO: Walk around the room observing students as they work. Offer assistance as needed and collect posters as students finish. When Learn time is almost over, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: Please bring your Arranging Chairs posters to the front if I do not already have them. We will discuss your work during Reflect. Clean up and return to your seats.

 **STUDENTS DO:** Display posters on the board and clean up supplies.



Reflect (5 to 10 minutes)

Directions

Note to the Teacher: The Arranging Chairs posters give students a visual reference of all the factor pairs for a given number. Keep them posted and reference them often as students are learning multiplication facts.

1. **TEACHER SAY: Take 1 minute to look at all the posters. What do you notice? I will use Calling Sticks to hear your observations.**

 **STUDENTS DO:** Spend 1 minute looking at posters and then, if called on, share observations.

TEACHER DO: Guide observations by asking questions such as:
- How do you know you have all the arrays for a number?
- What do you notice about the relationship between factors and the product?
- Are there any numbers that might have only one array?

TEACHER SAY: Nice work. Let's keep these posters so that we can continue to look at all the factor pairs for different products as we learn our multiplication facts.

Lesson 26 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this math lesson, students make a connection between counting by 5s, or multiples of 5, with telling time on an analog clock. In Primary 2, students learned how to tell time to the hour, half hour, and quarter hour. This will be reviewed first.	Students will: • Skip count by 5s. • Explain the relationship between skip counting by 5s and telling time to 5-minute increments. • Read and write time in 5-minute increments on an analog clock.	• Clock • Half • Hour • Minute • Time

LESSON PREPARATION FOR THE TEACHER

- Make a large demonstration model of an analog clock. See Chapter Preparation for Lesson 26 for additional details.
- Create a large version of the image on page Lesson 26: Apply.

MATERIALS

- Large analog clock face
- Large version of "train" of colored blocks
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Draw four analog clocks on the board showing the following times: 2:00, 9:30, 5:45, and 7:15. If possible, make the hour hand and the minute hand different colors. Also have the teacher model clock available and ready to use.

TEACHER SAY: Last year, we learned about clocks and how to tell and write time. Let's review to see how much we remember.

TEACHER DO: Ask the questions below quickly to review. Call on a variety of students and use the large model clock as needed.

- What do the numbers 1 to 12 represent on the clock?
- Which hand tells the hour?
- Which hand tells the minutes?
- How many minutes are in an hour?
- How do we write the time?

TEACHER SAY: Great. Now that we have reviewed some of the basics, let's look at the four clocks on the board. Turn to your Shoulder Partner and tell the time on these four clocks. Give me a Thumbs Up if you would like to share.



STUDENTS DO: Talk to partner about the time on the four clocks. Give a **Thumbs Up** to volunteer. Selected students tell the time on the clocks.

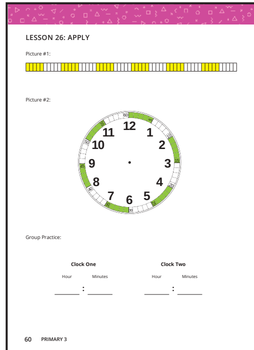
TEACHER DO: Be sure to provide additional practice at a later time if students have forgotten how to tell time to the hour or half hour. Time to the quarter hours (before and after) will be reviewed again soon.

TEACHER SAY: Good job. Some of those were challenging. We are going to work more on time today so you will have more practice.



Learn (35 to 45 minutes)

Directions



1.**TEACHER SAY: How did some of you know this clock (point to the one with 9:30) was 9:30? I do not see any 30 on the clock. Raise your hand to share your thinking.**



STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER SAY: Even if you think you understand how to tell the minutes, let's explore further. Take out your Mathematics Student Book and turn to page Lesson 26: Apply. Picture #1 shows a "train" of colored squares. Take a minute to look at how it is organized and count how many total squares are in the train. Give me a Thumbs Up when you have an observation to share.

TEACHER DO: Display your large copy of the train.

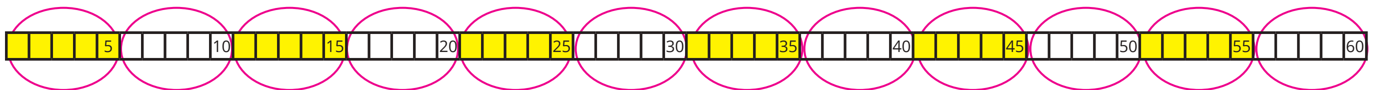


STUDENTS DO: Take out student book and look at the image. Give a **Thumbs Up** to volunteer. Selected students share observations and totals.

TEACHER SAY: Nice job. This train has 60 squares in groups of 5. Since they are in groups of 5, let's skip count by 5s together as I circle each group of 5 and write the multiple at the end of each group.



STUDENTS DO: Skip count aloud with teacher from 5 to 60.



TEACHER DO: As students skip count, circle each group of 5 and write the multiple (5, 10, 15…) in the last box of each group. See the example below.

2.**TEACHER SAY: Nice job skip counting. I circled each group of 5. How many groups of 5 are there in 60? Let's count the groups together.**



STUDENTS DO: Count aloud the groups with the teacher.

TEACHER SAY: There are 12 groups of 5, for a total of 60. Now look at Picture #2 in your book. The train has been wrapped into a circle and placed on top of a clock. What do you notice? Raise your hand to share.



STUDENTS DO: Raise hand to volunteer. Selected students share observations.

TEACHER DO: Students should notice that the multiples of 5 line up with the hour numbers 1 to 12 and that every group of 5 has a new number.

TEACHER SAY: How many groups of 5 does it take to get to 30?



STUDENTS DO: Call out the answer.

TEACHER SAY: The hour numbers line up with the multiples of 5. Six groups of 5 is 30. 6 × 5 = 30. This is why at 9:30 the minute hand is pointing at the 6. Thirty minutes have passed since the hour started. Knowing the multiples of 5 can help us to tell time. Let's try some more.

TEACHER DO: Model the next learning task using the large teaching clock.

TEACHER SAY: What number will the minute hand point to when 10 minutes have passed? Hold up that many fingers to show me.

TEACHER DO: Repeat for each multiple of 5 (15 minutes, 20 minutes, and so on). Continue until the class understands.



STUDENTS DO: Determine where on the clock the minute hand would be and hold up that many fingers.

TEACHER SAY: Now it is your turn to practice. In your student book, there are two boxes. I will show a time on my clock. Work with your Shoulder Partner to tell the time and write it in the box. When you are done writing, give me a Thumbs Up and we will discuss and repeat the process. Remember that we are all learning, so it is okay to make mistakes and ask questions.

TEACHER DO: Show 8:10 on your clock. Allow time for students to discuss and record the time.



STUDENTS DO: Work with a partner to read and record the time shown on the teacher's clock. Give a **Thumbs Up** when finished. Selected students share answers.

TEACHER DO: Repeat for 2:50.



STUDENTS DO: Work with a partner to read and record the time shown on the teacher's clock. Give a **Thumbs Up** when finished. Selected students share answers.

TEACHER SAY: Good job. For the rest of the Learn time, you will work with your Shoulder Partner to tell the time on the clocks in your book. Remember that each number 1 to 12 tells how many groups of 5 minutes. Record each time below the clock. You and your partner should agree on the answer before you write it down. If you do not agree, discuss with each other how you found your answers and decide which answer you think is correct.



STUDENTS DO: Work with a partner to read the clocks in the student book, determine what time is being shown, and record the answer.

TEACHER SAY: Good work telling and writing time. Put away your book for Reflect.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today we discovered that each number from 1 to 12 on the clock represents a group of 5 minutes. That shows how many minutes have passed, but where would the minute hand point if 60 minutes had passed? Where are 0 minutes? Turn and Talk with your Shoulder Partner. Raise your hand to volunteer. I will use Calling Sticks to select some of you to share your thinking.**



STUDENTS DO: Discuss with partner for about 2 minutes. Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Listen to students' ideas, providing correction, clarification, or praise as appropriate.

TEACHER SAY: In our next math lesson, we will continue to practice telling time and will talk more about 0 minutes and 60 minutes. Give your Shoulder Partner a high five for today.



STUDENTS DO: Give partner a high five.

Lesson 27 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students deepen understanding of how to tell time in 5-minute increments on an analog clock. They record times while playing a game and then compare who has the later time. In Reflect, students analyze a common misconception about telling time.	Students will: • Use a variety of strategies to tell time to 5-minute increments. • Analyze and correct an incorrect time.	• Clock • Half • Hour • Minute • Time

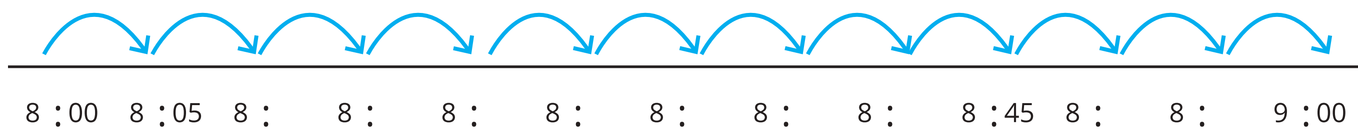
LESSON PREPARATION FOR THE TEACHER	MATERIALS
Print and cut out a set of number cards 1 to 11 (one set per pair of students). See the Number Cards 1–12 Blackline Master. (Students will not need the 12 card for today's lesson.)	• Number cards 1 to 11 • Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Draw a number line on the board like the example shown below.



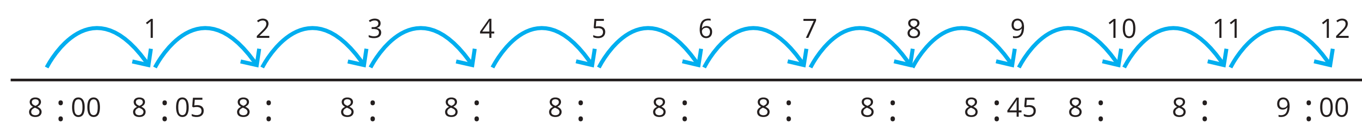
TEACHER SAY: On the board is a line segment, but instead of numbers there are times. Turn to your Shoulder Partner and discuss what you notice and what you think might go in the blank spaces. Give me a Thumbs Up when you are ready.



STUDENTS DO: Talk to partner about the number line. Give a **Thumbs Up** when ready. Selected students share thinking with the group.

TEACHER SAY: Good job. This line segment represents one hour of time from 8:00 to 9:00. The hops on the top of the line represent 5-minute jumps. In our last math lesson, we looked at how each number 1 to 12 on the clock was a group of 5 minutes. When the long hand—the minute hand—is on the 1, for example, 5 minutes have passed. When the minute hand is on the 2, 10 minutes have passed.

TEACHER DO: Write the minute hand numbers above each 5-minute increment as shown below. Continue to 9:00.

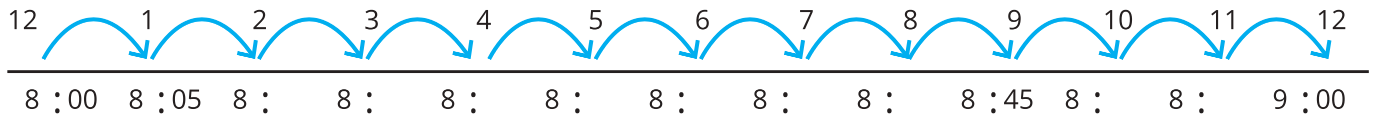


TEACHER SAY: We also discussed where the minute hand might be when 0 minutes have passed the hour and when 60 minutes have passed the hour. At the beginning of this line, there are 0 minutes. Raise your hand if you know what number I should write above 8:00, when 0 minutes have passed since 8:00. I would like to hear your thinking.



STUDENTS DO: Raise hand to volunteer. Selected students share answers and explain thinking.

TEACHER DO: If necessary, ask questions to help students understand that the minute hand points to 12 if 0 minutes or 60 minutes have passed since the hour.



TEACHER SAY: So where does the minute hand point when 0 minutes have passed the hour?



STUDENTS DO: Call out responses.

TEACHER SAY: It points to the 12. And where does the minute hand point when 60 minutes have passed the hour?



STUDENTS DO: Call out answers.

TEACHER SAY: It points to the 12. That can be confusing, but when one whole hour passes, that is 60 minutes. So, the MINUTE hand is back at the 12, but the HOUR hand has moved to the next hour, from 8:00 to 9:00.

TEACHER DO: **Model** on the clock moving the hour in between 8 and 9. Count by 5s, and when the minute hand gets to the 12, state that it is now 9:00. Be sure to show the hour hand moving slowly as well, staying in between 8 and 9 until the minute hand has gone all 60 minutes around.

TEACHER SAY: Raise your hand if you can summarize what we have learned about telling time when 0 minutes or 60 minutes have passed the hour.



STUDENTS DO: Raise hand to volunteer. Selected students summarize learning about telling time.

TEACHER SAY: Now let's play a game to keep practicing this idea of multiplying by groups of 5 to tell time.



Learn (35 to 45 minutes)

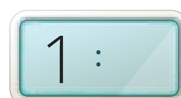
Directions

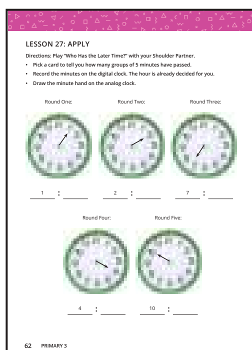
1.TEACHER DO: Draw two clocks on the board with just the numbers, no hands. Under the clock record:











LESSON 27: APPLY

Directions: Play "Who Has the Later Time?" with your Shoulder Partner.

- Pick a card to tell you how many groups of 5 minutes have passed.
- Record the minutes on the digital clock. The hour is already decided for you.
- Draw the minute hand on the analog clock.

Round One: 1 : ____

Round Two: 2 : ____

Round Three: 7 : ____

Round Four: 4 : ____

Round Five: 10 : ____

62 PRIMARY 3

TEACHER SAY: We practiced telling and writing time to the nearest 5 minutes and realized that multiplying by 5 can help us tell time. Let's practice some more today with a game. Take out your Mathematics Student Book and turn to page Lesson 27: Apply.



STUDENTS DO: Take out student book and turn to the appropriate page.

TEACHER SAY: This game is called Who Has the Later Time? To play, we will use a set of number cards 1 to 11 and pictures of clocks. I have drawn on the board an example just like the page in your book. Raise your hand if you would like to come up and be my partner to model the game.

 **STUDENTS DO:** Raise hand to help model. If chosen, be the teacher's partner.

TEACHER SAY: Each player has a clock in the student book for each round. Notice that only the hour hands are drawn on the clock faces. It will be your job to draw minute hands. Under the clock, you will record the time on the digital clock.

Now I will pick a card to find out how many minutes have passed 1 and then draw the minute hand on the clock. Imagine I have picked a 4. That means my minute hand will point at the 4.

TEACHER DO: Model drawing a minute hand to the 4.

TEACHER SAY: Now, I need to figure out the time. How many minutes have passed since 1:00 if the minute hand is pointing at the 4? Remember, each number is a group of 5, and we have been working on our multiplication facts.

TEACHER DO: Model skip counting by 5 from 1 to 4 on the clock. Help students make the connection between skip counting and the multiplication fact 4 × 5 = 20.

TEACHER SAY: I skip counted 5 four times. 4 × 5 = 20, so 20 minutes have passed. I record the time 1:20. Now it is my partner's turn to pick a card.

 **STUDENTS DO:** Helper student picks a card and repeats the process (with help from teacher or other students, if necessary).

TEACHER SAY: Now we both have hands on our clock that represent the time we recorded. My clock shows 1:20, but my partner's clock shows _____ (student helper's time). Who has the later time?

 **STUDENTS DO:** Call out answers.

TEACHER DO: Confirm later time.

TEACHER SAY: Wonderful. Then we play again, picking a new card, multiplying by 5 to find the minutes, and recording the time on the analog clock and digital one. Each round, you determine who has the later time. What questions do you have?

 **STUDENTS DO:** Ask clarifying questions, if necessary.

TEACHER SAY: You will play with your Shoulder Partner. One partner will come up and get a deck of cards. You will play for the rest of the Learn time. If you finish five rounds, work on the Challenge problems.

 **STUDENTS DO:** Get supplies and spend the rest of Learn time playing Who Has the Latest Time? If five rounds are played, do the Challenge problems.

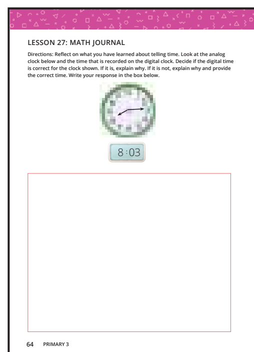
TEACHER DO: As students work, walk around observing students as they find and record the time on analog and digital clocks.

TEACHER SAY: Good work today telling and writing time and practicing your 5 multiplication facts. Keep out your student book for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 27: MATH JOURNAL

Directions: Reflect on what you have learned about telling time. Look at the analog clock below and the time that is recorded on the digital clock. Decide if the digital time is correct for the clock shown. If it is, explain why. If it is not, explain why and provide the correct time. Write your response in the box below.

8:03

64 PRIMARY 3

1. **TEACHER SAY: Turn to page Lesson 27: Math Journal. Look at the clock and the digital time that is recorded below it. Decide if the digital time is correct for the clock shown. If it is, explain why. If it is not, explain what is wrong and correct the time.**



STUDENTS DO: Look at the clock and decide if the time stated is correct or not. Explain thinking and make any corrections.

TEACHER DO: At the end of Reflect, collect student books to see how students responded. This Reflect can serve as an assessment of students' understanding about telling time in 5-minute increments.

TEACHER SAY: Nice job telling time and practicing your 5 multiplication facts at the same time.

Note to the Teacher: Use today's Math Journal as a check for students' understanding. If students do NOT notice that the time is not 8:03, be sure to reteach. Correct answers could include quarter past (a Primary 2 concept) or 8:15 (counting by 5 three times).

Lesson 28 Overview

LESSON OVERVIEW

In today's lesson, students use sharing stories as an introduction to the concepts of equal shares (also referred to as fair shares) and division. Students are invited to try a variety of strategies for dividing, including drawing and modeling. Some students may understand the concept of division as sharing well before they can represent it mathematically. The goal of this lesson is to begin developing a deeper understanding of the connection between equal shares and division.

LEARNING OBJECTIVES

Students will:

- Use manipulatives to model division.
- Explain the relationship between sharing equally and dividing.
- Use a variety of strategies to solve sharing division problems.

KEY VOCABULARY

- Equal
- Divide
- Fair share
- Model

MATERIALS

- Sets of 50 counters (one teacher set and one set for each pair of students)
- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Prepare sets of 50 counters (one teacher set and one set for each pair of students). See Chapter Preparation for Lesson 28 for detailed instructions.
- Display Thinking Like a Mathematician anchor chart.



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: **Yesterday I bought a package of 12 cookies at the store. I wanted to share them equally with a friend. How many cookies should each of us get? You may talk to a partner or use a piece of scrap paper to solve the problem. Give me a Thumbs Up when you have an answer.**



STUDENTS DO: Work independently or with a partner to solve the problem. Give a Thumbs Up when they are ready. Selected students share answers and explain thinking.

TEACHER SAY: **Let's double-check using counters. Raise your hand if you would like to help me.**



STUDENTS DO: Raise hand to volunteer. Selected student goes to the front of the room and counts out 12 counters to represent 12 cookies.

TEACHER SAY: **We need to make two groups, one for me and one for my friend. Should each group have the same number of cookies in it?**

STUDENTS DO: Call out responses.

TEACHER SAY: **Why? Who can help me understand why the groups should be equal?**



STUDENTS DO: Raise hand to volunteer. Selected students explain thinking.



TEACHER DO: If students do not mention the concept of fairness, explain that each person should get a fair share of the cookies. In order to be fair, the groups should be equal.



STUDENTS DO: Helper student counts out the counters one at a time into two piles and confirms that the piles are equal. Example: One for me, one for my friend, two for me, two for my friend, until each pile has 6 counters.

TEACHER DO: Thank the student helper and allow them to sit down.

TEACHER SAY: **Twelve cookies divided into 2 equal groups equals 6 cookies in each group. What if there were 4 of us? How many cookies would we each receive? You may talk to a partner or use a piece of scrap paper to solve the problem. Give me a Thumbs Up when you have an answer.**



STUDENTS DO: Work independently or with a partner to solve the problem. Give a **Thumbs Up** when they are ready. Selected students share answers and explain thinking.

TEACHER DO: Either call another volunteer to help you model the solution or ask students to share with the whole class the work they did at their seats.



STUDENTS DO: Help the teacher (or each other) model the solution to the new division problem, explaining and demonstrating thinking.

TEACHER SAY: **Wonderful work. Thank you for your help.**



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY:** **Over the past several weeks, we have been working on problems in which we start with a group and multiply it a number of times, making it greater. Today we will start working on sharing problems. In sharing problems, we take a number and divide it into smaller equal groups. When we solve sharing problems like the ones we just did together, we want to make sure that everyone in the group gets a fair share, or an equal amount. You will work with your Shoulder Partner.**

TEACHER DO: Distribute sets of counters to partners.

TEACHER SAY: **Listen to the following story problem: Two friends went out to pick fruit together. They picked 14 pieces of fruit from a tree and shared, or DIVIDED, the fruit evenly between themselves. How many pieces of fruit did each friend have? Work with your partner to solve the problem.**



STUDENTS DO: Work with a partner to create a group of 14 counters and divide it equally into 2 groups.

Note to the Teacher: Instead of walking the students through each step, see if they can take the model from Connect and apply it to a new problem. If students are struggling, help them break the problem into two steps: first take out 14 counters and then make 2 equal groups. However, give them time to work through it themselves first, talking to a partner and confronting confusion or misunderstandings as they go.

TEACHER DO: Repeat the question as needed and walk around the room. Call on students to share thinking with the class.



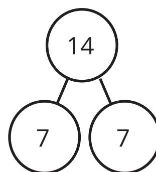
STUDENTS DO: Selected students share answers, explain thinking, model work, and answer questions for the whole group.

TEACHER SAY: **Great job dividing 14 pieces of fruit into 2 equal groups. Another way we practice Thinking Like a Mathematician is to MODEL with mathematics. When we model with mathematics, we use objects, math drawings, and equations to help us solve real-world problems. Let's add "Mathematicians model with mathematics." to our Thinking Like a Mathematician anchor chart.**

TEACHER DO: Add "Mathematicians model with mathematics." to the anchor chart.

TEACHER SAY: **Watch as I draw a picture to show the problem you just solved. My picture will show a part-part-whole relationship.**

TEACHER DO: Draw a part-part-whole representation of 14 ÷ 2 = 7 on the board.



TEACHER SAY: Here we take the number of objects we are starting with and write it in the biggest circle. That is the whole. Since we are sharing the 14 pieces of fruit between 2 people, we draw 2 smaller circles and share the fruit between those 2 circles. Those are the parts. When 14 pieces of fruit are shared evenly, both friends get 7 pieces. We are modeling with mathematics by using a picture to explain our real-world problem. Let's practice two more story problems together.

TEACHER DO: Draw a large circle on the board to represent the starting number for the next problem. Leave room below for 5 smaller circles.

TEACHER SAY: Nabil has 25 pieces of candy that he wants to give to his friends. He will share the candy evenly among 5 friends and not keep any for himself. How many pieces of candy will each friend receive? What should we write in the big circle? How do you know?

TEACHER DO: Use **Calling Sticks** to select students to share thinking.



STUDENTS DO: Selected students answer the teacher's questions, asking for help from friends as needed. One student goes to the board and writes 25 in the big circle.

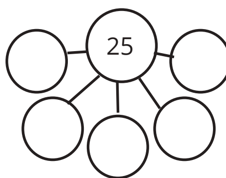
TEACHER SAY: Great job. How many smaller circles should we draw below? How do you know?



TEACHER DO: Use **Calling Sticks** to select students to share thinking.



STUDENTS DO: Selected students answer the teacher's questions, asking for help from friends as needed. One student goes to the board and draws 5 smaller circles and connects them to the circle containing the 25.



TEACHER SAY: Now work with your partner to figure out how many pieces of candy should go into each circle. Remember that each circle must have an equal number of counters.



STUDENTS DO: Work with a partner, using counters to solve the problem.

TEACHER DO: Walk around the room to see how students are solving the problem. Have students share out answers, explain thinking, and show work when finished. Select a student to record the answer on the board.



STUDENTS DO: Share answers, explain thinking, and show work. Selected student records 5 in each small circle on the board.

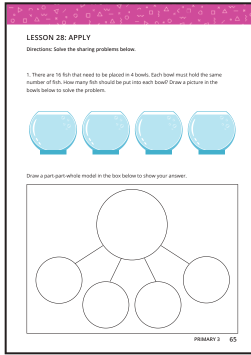
TEACHER DO: Repeat the above with the next problem.

TEACHER SAY: Aya made 24 pieces of aish baladi to give to 8 friends. How many pieces will each friend get if everyone gets a fair share?



STUDENTS DO: Determine how to create the model. Work with a partner, using counters

to solve the problem. Share answers, explain thinking, and show work. Selected students record division model on the board (part-part-whole circles).


LESSON 28: APPLY

Directions: Solve the sharing problems below.

1. There are 16 fish that need to be placed in 4 bowls. Each bowl must hold the same number of fish. How many fish should be put into each bowl? Draw a picture in the bowls below to solve the problem.

Draw a part-part-whole model in the box below to show your answer.

PRIMARY 3 65

2. TEACHER SAY: **Amazing work. Now it is time for you to practice solving sharing problems without me. Please turn in your Mathematics Student Book to page Lesson 28: Apply. You will work with your partner and can use your counters or another strategy to solve the problems.**



STUDENTS DO: Take out student book and work with a partner to solve the problems. Use counters as needed.

TEACHER DO: Walk around and observe how students solve the problems: How many students use the counters? How many solve using guess and check (trying out a number to see if it works)? What other strategies do students use? When there are approximately 5 minutes left in the Learn section of class, use an **Attention Getting Signal** to bring the class back together.

TEACHER SAY: **I saw some excellent problem-solving and modeling today. Let's share out the answers for each problem quickly and then let's talk about how we solved these problems.**

TEACHER DO: Go over each problem solution and answer with students. Discuss any problems for which students have discrepancies in answers. Help students analyze errors and identify misunderstandings.

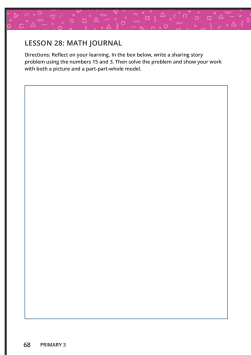


STUDENTS DO: Chorally share the answers when the teacher asks for them. Identify inaccuracies and misconceptions. Work with the teacher and each other to correct errors.



Reflect (5 to 10 minutes)

Directions


LESSON 28: MATH JOURNAL

Directions: Reflect on your learning. In the box below, write a sharing story problem using the numbers 15 and 3. Then solve the problem and show your work with both a picture and a part-part-whole model.

68 PRIMARY 3

1. TEACHER SAY: **Please turn to page Lesson 28: Math Journal. It is your turn to be the teacher and think like a mathematician. Use the numbers 15 and 3. Write a sharing story problem about these numbers and solve the problem. Remember to show your work in a drawing and a part-part-whole model.**



STUDENTS DO: Create a division story problem using the numbers 15 and 3. Solve the problem and show the solution in a drawing and a part-part-whole model.

TEACHER DO: Give students a few minutes to complete the journal entry. Be sure to collect students' books and review their work to determine current levels of understanding of dividing and creating equal groups.

TEACHER SAY: **Nice work today. You are already developing a good understanding of division. When you go home today, think about the ways you use division—or sharing—outside of school.**

Lesson 29 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students work with partition division problems. In sharing division problems, students knew the total and how many groups. They solved for how many in each group. In partition division problems, students know the total and how many in each group. They solve for how many groups. This distinction is subtle but important and will help students build a foundation for missing factor problems in the next lesson. Students will use counters and mathematical drawings to solve these problems.	Students will: • Use a variety of strategies to solve division problems. • Explain their thinking when solving division problems. • Discuss the importance of perseverance.	• Quotient

LESSON PREPARATION FOR THE TEACHER

No additional lesson preparation needed.

MATERIALS

- Sets of 50 counters (one teacher set and one set for each pair of students)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.**TEACHER SAY: To start today's lesson, I would like to introduce a new vocabulary word. It is a big word. The word is QUOTIENT. A quotient is the answer to a division problem. When you find the answer to a division problem, you are finding the quotient. Say, "Quotient."**



STUDENTS DO: Say, "Quotient."

TEACHER SAY: Today for Connect, please think about the following problem: If I have 16 balloons and want to tie them into groups of 2 to give to my friends, how many groups can I make? Remember, each group is made up of 2 balloons and I have 16 balloons to start with. Give me a Thumbs Up when you have an answer. You may use any strategy you like to solve the problem, but be prepared to share your thinking with the class.

TEACHER DO: Give students a minute of **Wait Time**.



STUDENTS DO: Solve the story problem using a strategy that makes sense to them. Give a **Thumbs Up** when ready. Selected students share answers and explain the strategy used, drawing solutions on the board.

Note to the Teacher: Students may use a variety of strategies to solve the problem, including drawing, manipulatives, or mental math. Examples of explanations may include: I counted by 2s on my fingers; I looked around the class at other students and pretended they were each holding 2 balloons; and so on.

TEACHER SAY: How is this problem different than the sharing cookies problem we did, where I had 12 cookies and shared them equally between 2 people? Talk to your Shoulder Partner about the difference. Raise your hand when you are ready.



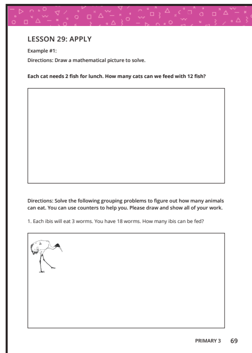
STUDENTS DO: Talk to partner about the differences between the two kinds of problems. Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If necessary, explain that the cookie problem is a sharing problem and the balloon problem is a grouping problem. In the cookie problem, the number of groups is known, but not how many cookies will be in each group. In the balloon problem, the number in each group is known, but not how many groups there are.



Learn (35 to 45 minutes)

Directions



LESSON 29: APPLY

Example #1:

Directions: Draw a mathematical picture to solve.

Each cat needs 2 fish for lunch. How many cats can we feed with 12 fish?

Directions: Solve the following grouping problems to figure out how many animals can eat. You can use counters to help you. Please draw and show all of your work.

1. Each ibis will eat 3 worms. You have 18 worms. How many ibis can be fed?

PRIMARY 3 69

1.TEACHER SAY: **Today we are going to use pictures to solve grouping problems in division. Sometimes we know how many things we want in each group, but we do not know how many groups we can make. Let's try a problem together. Turn in your Mathematics Student Book to page Lesson 29: Apply and look at the first sample problem.**



STUDENTS DO: Turn to page Lesson 29: Apply in the student book.

TEACHER SAY: **Drawing pictures is an effective problem-solving strategy. When we draw pictures in math, they are quick sketches to help us show our thinking. Drawing like a mathematician is different than drawing like an artist. It is a time for quick work. Draw a picture to solve this problem: Each cat needs 2 fish for lunch. How many cats can we feed with 12 fish?**



STUDENTS DO: Draw a picture to solve the problem.

TEACHER DO: Walk around the room and observe how students are solving the problem. Note whether or not students solved the problem in different ways.

TEACHER SAY: **I saw a lot of different drawings around the room. Please raise your hand if you would like to share your strategy and your drawing with the class.**



STUDENTS DO: Raise hand to volunteer. Selected students share drawings and explain thinking. If possible, students draw work on the board.

2.TEACHER SAY: **Today you will practice solving grouping division problems in your student book. There is space provided for you to explain your thinking in pictures. You may also use a set of counters if you need them. You will need to share a set with a partner, but there are enough for both of you. Please open your books and begin. Be sure to show your work using pictures.**



STUDENTS DO: Work independently to solve division story problems in the student book.

TEACHER DO: As students work, walk around the room and observe how students solve the problems. Which students use counters? Which students solve using guess and check (trying out a number to see if it works)? What other strategies do students use? When there are approximately 5 minutes left in the Learn section of class, use an **Attention Getting Signal** to bring the class back together.

TEACHER SAY: **I saw some excellent problem-solving and modeling today. Let's share out the answers for each problem quickly and then let's talk about how we solved these problems.**

TEACHER DO: Go over each problem solution and answer with students. Discuss any problems for which students have discrepancies in answers. Help students analyze errors and identify misunderstandings.



STUDENTS DO: Chorally share the answers when the teacher asks for them. Identify inaccuracies and misconceptions. Work with the teacher and each other to correct errors.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY:** **Nice job today working on grouping problems. Remember, in a grouping problem you know how many objects you want in each group, but you do not know how many groups you will make. Please turn to your Shoulder Partner and share something that went well today and something that was difficult.**

 **STUDENTS DO:** Share thinking with a partner.

TEACHER SAY: **What does it mean to persevere? Why is it important to persevere when we are faced with challenging problems? Give me a wave if you would like to share your thinking.**

 **STUDENTS DO:** Wave at the teacher to volunteer.

TEACHER DO: Listen to students' discussion points and help correct misconceptions, if necessary.

TEACHER SAY: **Nice job thinking like a mathematician. Sometimes in math things will go well and sometimes things will be difficult. Persevering through problems is what makes good mathematicians great, and all of you are hardworking mathematicians.**

Lesson 30 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In the final lesson of this chapter and theme, students explore the relationship between multiplication and division. They engage with fact family triangles and examine how two factors and one product work for both multiplication and division facts. Students also use the division symbol to record division equations for the first time.	Students will: • Describe the relationship between factors and their product. • Use the division symbol. • Apply the relationship between multiplication and division to identify fact families. • Solve division problems with one unknown.	• Division • Fact family • Symbol

LESSON PREPARATION FOR THE TEACHER

No new preparation needed.

MATERIALS

- Thinking Like a Mathematician anchor chart
- Sets of 50 counters (one teacher set and one set per pair of students)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1.TEACHER DO: Write the following problem on the board:

Sahar had 18 flowers. She wanted to put 5 flowers in each jar. How many jars would Sahar need?

TEACHER SAY: For the past two math classes, we have shared items and grouped items. Read the problem on the board and then talk to your Shoulder Partner about how you would solve this problem to find the quotient. Give me a Thumbs Up when you are ready to share.



STUDENTS DO: Read the problem and discuss their strategy with a partner. Give a **Thumbs Up** when ready. Share answer and explain thinking, if chosen.

Note to the Teacher: There will likely be some confusion about the fact that there are extra flowers.

TEACHER DO: Ask questions to help students understand how to think about problems that do not divide into equal groups. Examples: What should we do with the extra flowers? Do we need an extra jar? Allow students to discuss ideas for the extras. There are many different possibilities, so allow all that make sense. Call on multiple students to share thinking. At this point, it is not necessary to use the word "remainder."

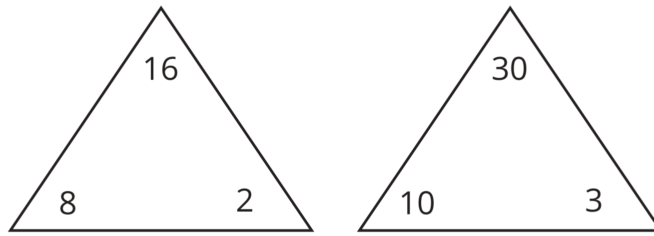
TEACHER SAY: You have so many good ideas. Sahar could fill 3 jars and have some leftovers. Sometimes when we share or group objects it does not always work out perfectly. You have to decide what to do with the leftovers.



Learn (35 to 45 minutes)

Directions

1.TEACHER DO: Draw the following on the board:



TEACHER SAY: Today we are going to explore something new. There are two triangles on the board. Each triangle has three numbers. Looking at one triangle at a time, what is the relationship between these three numbers? What is the relationship between 16, 8, and 2; and 30, 10, and 3? Think about it silently and give me a Thumbs Up when you have an idea.

TEACHER DO: Give students about a minute to think about the problem. Then call on students to share ideas. Record ideas on the board.

Note to the Teacher: It may be easiest for students to see that the two numbers on the bottom are factors of the number at the top to form a multiplication equation, 8 × 2 = 16. They may not, however, also see that 16 divided into 2 groups is 8.

2.TEACHER DO: Pass out counters to students.

TEACHER SAY: Let's see what else we can discover about the relationship between these numbers. Work with your Shoulder Partner to count out 16 counters.

 **STUDENTS DO:** Count out counters.

TEACHER SAY: Put those 16 counters into groups of 2.

 **STUDENTS DO:** Make 8 groups of 2.

TEACHER SAY: How many groups of 2 are in 16? Show me on your fingers.

 **STUDENTS DO:** Hold up 8 fingers.

TEACHER SAY: This time take your 16 counters and make groups of 8. Each group should have 8 counters in it.

 **STUDENTS DO:** Make 2 groups of 8.

TEACHER SAY: How many groups of 8 are in 16? Show me on your fingers?

 **STUDENTS DO:** Hold up 2 fingers.

TEACHER SAY: So looking at our triangle from before, is there anything more you could say about the relationship between the three numbers?

TEACHER DO: Call on students to share thinking. At this point, students should begin to understand that when you divide the top number by one of the factors, you get the third number. They may not use this vocabulary, but may instead say group, share, smaller number, and so on. Help students understand and use the proper mathematical terminology.

TEACHER SAY: 2 and 8 are FACTORS of 16. We call these three numbers a FACT FAMILY because they are related. They are a multiplication fact family because when 2 and 8 are multiplied, you get the product 16. 2 and 8 are factors of 16. They are also a division fact family. If I take my 16 counters and put them into 2 piles, I have 8 in each pile. If I take my 16 counters

and put them into 8 piles, I have an equal number of counters, 2, in each pile. These numbers have a relationship. Let's try it with 30 counters.

TEACHER DO: Have students divide the counters into groups of 10 and groups of 3. Each time, they should count the number of counters in each group and ultimately recognize they have identified a fact family.

STUDENTS DO: Make a group of 30 counters. Divide the counters into 3 groups of 10 and 10 groups of 3.

TEACHER SAY: So these three numbers on the triangle are related. They form a fact family for multiplication and division. In our last two lessons, we have been dividing by sharing and by making equal groups. When we divide, we know the total and divide it into smaller parts. Raise your hand if you have ever seen the division symbol or might know what it looks like.

STUDENTS DO: Raise hand if they have seen a division symbol.

TEACHER DO: Record the division symbol (÷) on the board.

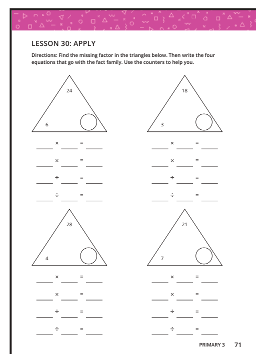
TEACHER SAY: This symbol is used by mathematicians when we have a total number of things that we are sharing or separating into groups. The sign has a line in the middle like the subtraction sign and then a dot at the top and one at the bottom. Draw the division symbol in the air.

STUDENTS DO: Draw the division symbol in the air.

TEACHER SAY: We can write two multiplication equations and two division equations for each fact family. Turn to your Shoulder Partner and discuss what those four equations might be for each triangle. Give me a Thumbs Up when you are ready to share.

STUDENTS DO: Talk to partner about the four equations. Give a **Thumbs Up** when ready. Selected students share equations and write them on the board.

TEACHER DO: Call on students to share and, if necessary, help guide students to record: $2 \times 8 = 16$; $8 \times 2 = 16$; $16 \div 2 = 8$; $16 \div 8 = 2$ and $3 \times 10 = 30$; $10 \times 3 = 30$; $30 \div 10 = 3$; $30 \div 3 = 10$. The division equations will be trickier. Students may write $2 \div 16 = 8$. Explain that since they are dividing the larger number into smaller groups, the larger number must go first.



TEACHER SAY: Great job. These triangles show us three numbers that make a fact family. Now it is your turn to practice and make some of your own fact family triangles. Each of you will create four fact families in your Mathematics Student Book on page Lesson 30: Apply. Turn to that page now.

STUDENTS DO: Turn to page Lesson 30: Apply in the student book.

TEACHER SAY: You will see on the page that each of the triangles has a total at the top. That is how many counters you will take out. Then you will also see that one of the factors is in the bottom corner, but the other one is missing. There is an empty circle where the other member of the family should be. Put your finger on the empty circle in the first problem.

STUDENTS DO: Put a finger on the empty circle.

TEACHER DO: Check to make sure students are following along.

TEACHER SAY: The factor you see is the number of groups you will create. Your challenge is to work with your partner to find the missing factor and record in the circle. Once you have found the missing factor, record the four equations for the fact family just like we did together. You can use counters or any other strategies you might have to find the missing factors. If you finish early, try the Challenge problems. What questions do you have?

STUDENTS DO: Ask clarifying questions, if needed. Work with a partner to find the missing factor in each fact family and then write four equations for each fact family. Students who finish early can work on the Challenge problems.

TEACHER DO: Walk around observing students and offering assistance where needed. At the end of Learn time, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: **Great job identifying and writing fact families. I saw and heard a lot of mathematical thinking today.**

 **STUDENTS DO:** Put away supplies and student book.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY:** **Today we looked at multiplication and division fact families, but I would like to hear from you about what you have learned. In your own words, how are multiplication and division related to each other? I will give you 1 minute to think quietly.**

 **STUDENTS DO:** Reflect quietly on the teacher's question.

TEACHER DO: Use **Calling Sticks** or another strategy to call on students to share ideas.

 **STUDENTS DO:** Selected students share ideas or ask a friend for help.

TEACHER DO: Listen carefully to students' responses and help them clarify points, if necessary. Ask students to support answers with evidence and encourage them to use math terminology. If possible, record students' thinking on the board or on chart paper (or have them record it). This may help students who are struggling with the concept to build understanding.

Note to the Teacher: Since this concept is new, many students may be struggling to make the connection between multiplication and division. However, this is an important conversation that will provide valuable formative assessment information. Take note of students who will need additional practice and support. Identify students who have a stronger understanding of the skills and concepts and who may be able to partner with students who need help.

TEACHER SAY: **We will continue to practice multiplication and division facts, but we always learn so much when we share our thinking with each other. Thank you for participating in today's Reflect discussion. I am very proud of the work you are doing to learn these challenging concepts. Give yourself a hug.**

 **STUDENTS DO:** Give themselves a hug.

PRIMARY 3

Mathematics

THE WORLD AROUND US

TAKING CARE OF OUR WORLD

Chapter 4

Lessons 31 to 40

Chapter 4: Lessons 31 to 40

Chapter Overview:

In this chapter, students will review and expand their understanding of two-dimensional shapes and dive deeper into multiplication. In the first few lessons of this chapter, students will learn about parallelograms and the category of quadrilaterals. Students will compare shapes based on their attributes. In the next few lessons, students will focus on the shapes of squares and rectangles as they develop an understanding of area. Moving from concrete tiling of these shapes, to comparing them to arrays, and then to computing with missing tiles, students will eventually build a conceptual understanding that area fills the inside of a polygon. Students will use non-standard units to fill shapes and refer to them as square units. Students will review the Commutative Property of Multiplication as they determine that, regardless of orientation, a vertical rectangle and a horizontal rectangle still have the same area. The next concept in this chapter will explore the Distributive Property of Multiplication. Using area and arrays, students will determine how to break a larger array into more manageable pieces that still help them find the total.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from their peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 31 to 40, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

2.a. Apply properties of operations as strategies to multiply and divide, including:

1) Commutative Property of Multiplication

- If $4 \times 3 = 12$ is known, then $3 \times 4 = 12$ is also known.

3) Distributive Property of Multiplication

- The problem $3 \times (4 + 2)$ can be solved as $3 \times 4 + 3 \times 2$.

D. MEASUREMENT AND DATA:

4.a. Collect, organize, and represent numerical data on a line plot.

5.a. Identify area as an attribute of plane figures.

5.b. Use non-standard measurements to calculate the area of a figure (in whole numbers).

5.c. Apply concepts of area measurement:

1) A square with side length 1 unit is said to have "one square unit" of area. This unit can be used to measure area.

5.d. Measure areas (in whole numbers) by counting unit squares.

E. GEOMETRY:

1.a. Identify rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

Computational Thinking

Throughout Lessons 31 to 40, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

D. MEASUREMENT AND DATA:

4.b. Solve story problems and analyze data displayed on a line plot.

CH 4 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
31	Students will: • Identify the attributes of two-dimensional shapes. • Define categories based on attributes. • Sort two-dimensional shapes based on their attributes. • Define polygon and parallelogram.
32	Students will: • Describe the attributes of quadrilaterals. • Compare and contrast quadrilaterals. • Sort quadrilaterals using a Venn diagram.
33	Students will: • Apply rules to sort quadrilaterals. • Combine quadrilaterals to create a picture. • Create a bar graph representing quadrilaterals to create a picture.
34	Students will: • Use manipulatives to build rectangles with specified dimensions. • Calculate the area of rectangles in square units.
35	Students will: • Determine the area of rectangles using strategies related to multiplication.
36	Students will: • Create and describe multiple rectangles with the same area. • Explain and model the Commutative Property of Multiplication.
37	Students will: • Define area in their own words. • Apply strategies to measure area.
38	Students will: • Divide arrays into smaller arrays to solve multiplication problems. • Explain why dividing arrays makes it easier to solve multiplication problems.
39	Students will: • Model the Distributive Property of Multiplication using arrays. • Apply the Distributive Property to solve multiplication problems. • Explain the Distributive Property of Multiplication.
40	Students will: • Apply the Distributive Property to solve multiplication problems. • Reflect on understanding of multiplication and the Distributive Property of Multiplication.

Chapter Preparation for Teacher

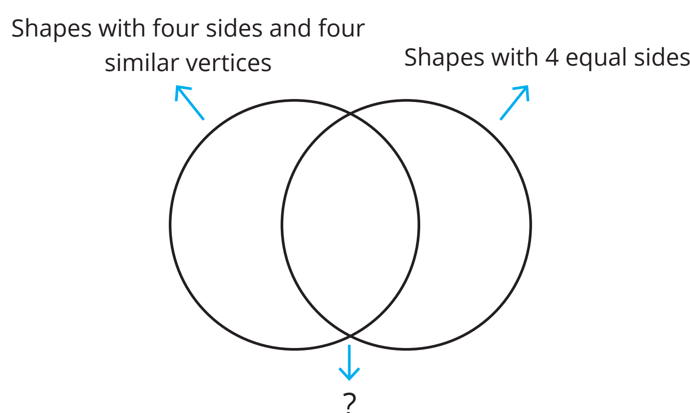
For Lesson 31:

- Create an anchor chart titled Two-Dimensional Shapes. Include images of the following shapes—square, rectangle, triangle, rhombus, parallelogram, octagon, hexagon, and trapezium—but do not label them. Students will help you label in the lesson.

For Lesson 32:

- Prepare sets of number cards or dice for the Connect activity.
  - You can use one die to practice facts to 6 or number cards to 12 if you have students who are already fluent with their 0 to 6 facts.
  - For the number cards, see the Number Cards 0–12 Blackline Master.
- Make a Quadrilateral Venn Diagram poster as shown below.

Quadrilateral Venn Diagram



For Lesson 33:

- Gather construction paper for pictures/designs (one sheet per pair of students).
- Students will also need scissors, glue, and coloring tools.

For Lesson 34:

- Print and cut sets of small 2 cm × 2 cm squares (one set of 40 for each pair of students). See the 2-CM Grid Blackline Master.
  - If your students are skilled with scissors, consider having them cut apart the squares prior to Lesson 34.
  - Store the sets of squares in plastic or paper bags for use in upcoming lessons.

For Lesson 35:

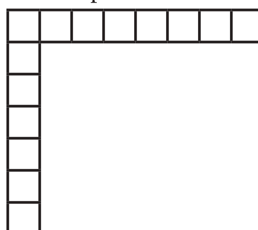
- Prior to the lesson, draw a large version of page Lesson 35: Connect (in the student book) on the board.
- Prior to the lesson, draw a large 6 × 8 array (with all the squares shown) on the board. Do not label the dimensions.

For Lesson 36:

- Prior to the lesson, write on the board the story problem from Lesson 36: Connect (in the student book). Also, draw a large version of page Lesson 36: Connect (in the student book) on the board.

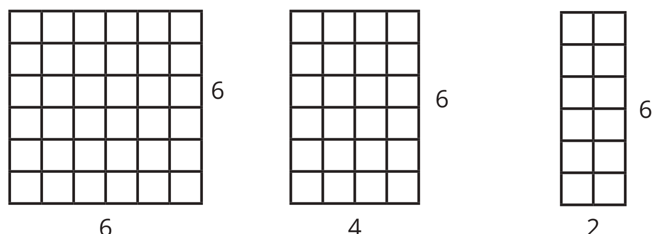
For Lesson 37:

- Prepare sets of number cards 1 to 10 (one set per student). See the Number Cards 0–12 Blackline Master.
- Prior to the lesson, draw the shape below on the board.



For Lesson 38:

- Prior to the lesson, write the following story problem on the board:
    - Adham creates a rectangle with an area of 6 square centimeters. Soliman creates a rectangle with an area of 6 square millimeters. Do the two rectangles have the same area? Why or why not?
- Prior to the lesson, draw the following arrays on the board:



For Lesson 39:

- Prior to the lesson, draw two 5 × 6 arrays on the board.

For Lesson 40:

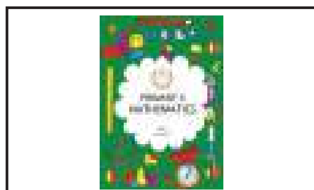
- Prior to the lesson, write the following problem on the board:

If I want to solve 6 × 9, which of the following will NOT help me. Why not?

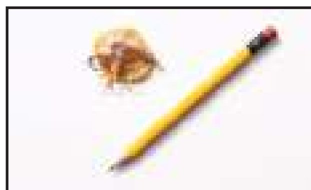
- (6 × 6) + (6 × 3)
- (6 × 4) + (6 × 4)
- (6 × 7) + (6 × 2)

Materials Used

Student book



Pencil



Dice



Scissors



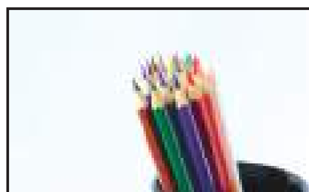
Glue



Construction paper



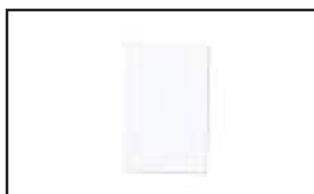
Colored pencils



Crayons



Paper



Plastic bags



Ruler



Number cards

Quadrilateral venn diagram poster

Centimeter squares

Lesson 31 Overview

LESSON OVERVIEW

In this lesson, students review two-dimensional shapes. As part of this review, students sort and match shapes based on given attributes. Students are introduced to a new shape—parallelogram—and determine how it relates to the shapes they already know. This review is needed to ensure students are prepared to learn more complex geometry concepts.

LESSON PREPARATION FOR THE TEACHER

- Create an anchor chart titled Two-Dimensional Shapes. See details in Chapter Preparation for Lesson 31.
- Draw a large version of the Apply page on the board before class.

LEARNING OBJECTIVES

Students will:
- Identify the attributes of two-dimensional shapes.
- Define categories based on attributes.
- Sort two-dimensional shapes based on their attributes.
- Define polygon and parallelogram.

MATERIALS

- Two-Dimensional Shapes anchor chart
- Mathematics Student Book and pencil

KEY VOCABULARY

- Attribute
- Closed figure
- Cube
- Hexagon
- Octagon
- Parallel
- Parallelogram
- Polygon
- Quadrilateral
- Rhombus
- Trapezium
- Vertex
- Vertices



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Display the Two-Dimensional Shapes anchor chart.

TEACHER SAY: Today we are going to review some shapes that we learned last year. Look at the shapes on the board. I am going to place a star by some of them. Raise your hand if you know what my category is or what attribute all these shapes share.

TEACHER DO: Place a star by all of the polygons (not the circle or cube).

 **STUDENTS DO:** Raise hand to volunteer. Selected students share thinking.

Note to the Teacher: Students should recognize that the starred shapes have straight sides. If they do not, ask questions to help them build understanding.

TEACHER SAY: All of these shapes are two-dimensional and have straight sides. Who can tell me why the cube and circle do not fit into this category? Raise your hand if you know.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Confirm correct answers: The cube is three-dimensional, and the circle does not have straight sides.

TEACHER SAY: For today and the next couple of math classes, we will focus on two-dimensional shapes with the attribute of straight sides. All these shapes have a specific name but are also part of a larger category called POLYGONS. All polygons have straight sides and are closed figures. A closed figure is a shape that does not have any gaps between the lines that make it.

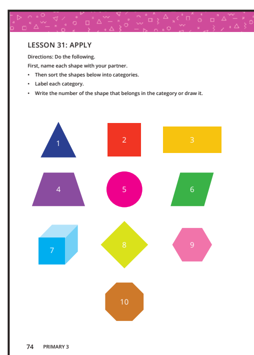
TEACHER DO: If necessary, draw a few examples of an open figure.

TEACHER SAY: A circle is a closed figure, but it is not a polygon because it does not have straight sides.



Learn (35 to 45 minutes)

Directions



LESSON 31: APPLY

Directions: Do the following.

First, name each shape with your partner.

- Then sort the shapes below into categories.
- Label each category.
- Write the number of the shape that belongs in the category or draw it.

74 PRIMARY 3

1. TEACHER SAY: Let's talk more about all these shapes. Open your Mathematics Student Book to page Lesson 31: Apply. On this page, you will see a collection of shapes like the ones on the board. We have already discussed that most of these shapes fit into the category of polygons, but let's make sure we know the specific names of these shapes. Turn to your Shoulder Partner and state the name of each shape. If you are not sure of the name, put a question mark next to the shape and we will discuss it as a group. You do not have to write anything at this time unless you need to write a question mark.

 **STUDENTS DO:** Turn to partner and talk about the shapes, stating the name and placing a question mark if the name is unknown.

TEACHER DO: Allow students to talk through the names of all the shapes. Discuss shape names that students do not know. Review the terms VERTEX and VERTICES and use the terms when discussing shape attributes. For now, students do not need to use the term ANGLES, but may recognize that some shapes have equal internal angles (such as the square), while others do not (such as the trapezium).

TEACHER SAY: You remembered so many of the shape names. One that most of us did not know was the PARALLELOGRAM. Say that word with me.

 **STUDENTS DO:** Say, "Parallelogram," aloud with the teacher.

TEACHER SAY: In the word parallelogram, we can see the word PARALLEL. The word parallel describes things, like lines, that can go on forever and never touch each other. They look like railroad tracks (or use another example familiar to your students).

TEACHER DO: Draw an example of parallel lines on the board.

TEACHER SAY: A parallelogram is a quadrilateral (a shape with four sides) that has opposite sides that are parallel. With your Shoulder Partner, see if you can identify the parallelograms in your student book.

 **STUDENTS DO:** Work with **Shoulder Partner** to point to all the parallelograms.

TEACHER DO: Make sure students notice that rectangles and squares are also examples of parallelograms. If needed, point this out.

TEACHER SAY: Great. Now that we are sure of the names of all these shapes, let's think about categories that we could sort them into. We discussed that the cube and circle do not fit into the category of polygons, but there are many other ways to sort these shapes.

With your Shoulder Partner, decide how you could sort these shapes into categories by looking at ATTRIBUTES that they share. Attributes are features, or characteristics, of something. For example, I might look at the square and the rectangle (shapes 2 and 3) and think, "Well, these two shapes have four vertices. That is an attribute those two shapes share." So I would label my category "Four Vertices." Then I would write the names of the shapes, write their numbers, or draw them. That example is done for you. What questions do you have about that part of the directions?

TEACHER DO: Direct students' attention to the example in the student book.

 **STUDENTS DO:** Look at example in book. Ask clarifying questions as needed.

TEACHER DO: Make sure students understand the directions before moving on.

TEACHER SAY: You may have shapes that you think go in more than one category or some shapes that cannot fit into a category. That is okay. You also do not need to have six categories but should have at least two. If you finish early, try the Challenge problem.



STUDENTS DO: Work with partner to sort the shapes into categories based on attributes. Draw or name the shapes or record the number of the shapes in each category.

TEACHER DO: Give students 15 minutes to sort shapes into categories of their choosing based on attributes. Walk around and observe how students are sorting and which shapes they are confused about. After most students are finished, or 15 minutes have passed, bring the group back together.

TEACHER SAY: Let's discuss how you sorted these shapes. Be sure to state the name of the shape and the category.

TEACHER DO: Use **Calling Sticks** to choose four or five partners to share the categories chosen. After they share, ask if anyone else had a similar category. Record categories on the board.



STUDENTS DO: Selected partners share categories and the shapes that fit the category.

TEACHER SAY: You found so many ways to sort these shapes. Did anyone have a shape that they just could not put together with another shape to make a category? Were there any shapes that did not seem to fit anywhere? Why? Give me a Thumbs Up to share.



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students discuss shapes that they could not categorize and explain why.

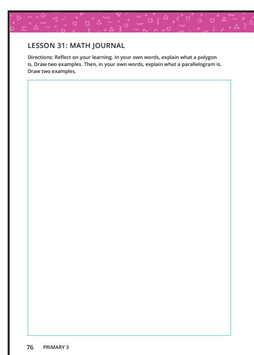
TEACHER DO: The circle and the cube may be mentioned again based on the discussion during Connect but allow any shapes if students can explain their reasoning. This should be a discussion, and students can disagree and explain their own thinking to support ideas. Use the cube to help guide students to understand two-dimensional shapes versus three-dimensional shapes.

TEACHER SAY: Good work sorting these shapes and thinking about their attributes. Keep out your student book for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 31: MATH JOURNAL

Directions: Reflect on your learning. In your own words, explain what a polygon is. Draw two examples. Then, in your own words, explain what a parallelogram is. Draw two examples.

76 PRIMARY 3

1. **TEACHER SAY: Turn to page Lesson 31: Math Journal.**



STUDENTS DO: Turn to page Lesson 31: Math Journal.

TEACHER SAY: Think about your learning. Then, in your own words, explain what a polygon is. Draw two examples. Then, in your own words, explain what a parallelogram is. Draw two examples.



STUDENTS DO: Respond to the journal prompt.

TEACHER DO: Allow students 1 to 2 minutes to work. If time permits, call on a few students to share.

Lesson 32 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
Students begin the lesson playing a game to build multiplication fluency. This game will be repeated as review in a future lesson. Then students explore quadrilaterals and identify the attributes as they compare different quadrilaterals using a Venn diagram.	Students will: • Describe the attributes of quadrilaterals. • Compare and contrast quadrilaterals. • Sort quadrilaterals using a Venn diagram.	• Review vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

- Prepare sets of number cards or dice for the Connect activity. See Chapter Preparation for Lesson 32 for details.
- Prepare a Quadrilateral Venn Diagram poster. See Chapter Preparation for Lesson 32 for details.

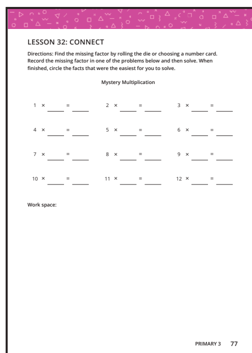
MATERIALS

- Number cards 0 to 12 or one die per partner group
- Quadrilateral Venn Diagram poster
- Scissors
- Glue for each partner set
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions


LESSON 32: CONNECT

Directions: Find the missing factor by rolling the die or choosing a number card. Record the missing factor in one of the problems below and then solve. When finished, circle the facts that were the easiest for you to solve.

Mystery Multiplication

1 × ___ = ___ 2 × ___ = ___ 3 × ___ = ___

4 × ___ = ___ 5 × ___ = ___ 6 × ___ = ___

7 × ___ = ___ 8 × ___ = ___ 9 × ___ = ___

10 × ___ = ___ 11 × ___ = ___ 12 × ___ = ___

Work space:

PRIMARY 3 77

Note to the Teacher: You can use one die to practice facts to 6 or number cards to 12 if you have students who are already fluent with 0 to 6 facts.

1. TEACHER SAY: **Today we are going to learn a quick game called Mystery Multiplication. Please take out your Mathematics Student Book and turn to page Lesson 32: Connect.**

What do you notice about the multiplication problems on this page? Raise your hand if you have an idea to share.


STUDENTS DO: Raise hand to volunteer. Selected students share thinking. Students should note that the problems are incomplete.

TEACHER SAY: **These are mystery multiplication problems. They are missing one factor. You will determine the missing factor by pulling a number card or rolling a die. You can solve any of the equations. For example, if your second factor is a 1 and you want to use that factor to solve 12 × ___= ___, that is fine. Record the 1 in the first blank and then multiply to find the product. Work for about 5 minutes solving as many problems as you can. Use the work space to skip count, draw an array, use repeated addition, or whatever works best for you to solve the problems. You will share a die (or number cards) with your Shoulder Partner.**

TEACHER DO: If needed, show the Connect page and quickly model how to play the game. As students work, walk around and observe how they solve the problems. After about 5 minutes, bring the group back together.


STUDENTS DO: Work with a **Shoulder Partner** to play Mystery Multiplication.

TEACHER SAY: **Good work practicing your facts. Look at the problems you solved. Circle the ones that you found easier to solve than others.**


STUDENTS DO: Circle the facts that were easy to solve.

TEACHER SAY: Great job. Be sure to practice the multiplication facts that you did not circle. Keep out your student book for Learn.



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Draw a square, rectangle, parallelogram, trapezium, and rhombus on the board.

TEACHER SAY: In our last math class, we listed attributes of the shapes on the board. Give me a Thumbs Up to share what you thought the common attributes were for these shapes.



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share thinking with the group.

TEACHER DO: Call on two to four students to share and record attributes.

TEACHER DO: If necessary, remind students that all of the shapes have four straight sides and four vertices and all of them are closed, so they are all polygons.

TEACHER SAY: Mathematicians put all these polygons into another special category, called QUADRILATERALS. The word part "quad" means four, so that helps us remember that these are shapes with four sides. Even though all of these polygons are quadrilaterals, they are not exactly the same. How are they the same? How are they different? Turn to your Shoulder Partner and discuss your observations. Give me a Thumbs Up when you are ready to share your ideas.



STUDENTS DO: Discuss the similarities and differences with a partner. Give a **Thumbs Up** to indicate they are ready to share. Selected students identify similarities and differences.

TEACHER DO: Record students' ideas on the board.

TEACHER SAY: Good thinking. These are all four-sided polygons, but they have differences. Today you are going to sort just quadrilaterals but in a special way.

TEACHER DO: Display Quadrilateral Venn Diagram poster.

TEACHER SAY: On this poster, you see two circles connected. This is called a Venn diagram, and you have used them before.

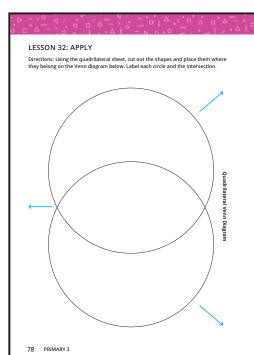
TEACHER DO: Read the descriptions above each circle.

TEACHER SAY: What do you think might go in the section that overlaps? Talk to your Shoulder Partner.



STUDENTS DO: Share thinking with a **Shoulder Partner**.

TEACHER SAY: The intersection will be for shapes that have four equal sides AND four vertices that look the same. This is the space for shapes that fit both rules. I will record that on my Venn diagram below the arrow.



LESSON 32: APPLY

Directions: Using the quadrilateral sheet, cut out the shapes and place them where they belong on the Venn diagram below. Label each circle and the intersection.

Quadrilateral Venn Diagram

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TEACHER DO: Point to location on the example diagram on the board.

TEACHER SAY: Open your student book to page Lesson 32: Apply.



STUDENTS DO: Turn to page Lesson 32: Apply.

TEACHER SAY: On this page there is a Venn diagram like the one on the board, but without the labels. There is also see a page of quadrilaterals. Label your Venn diagram like the one on the board, and then cut out the shapes. You will work with a partner and discuss with each other your thoughts about where to put each shape. However, you will complete your own

shapes in the Venn diagram in your own book. If they do not fit into either circle or the intersection, you can put them outside the Venn diagram. What questions do you have?

 **STUDENTS DO:** Ask clarifying questions, if necessary.

TEACHER DO: Use **Hands Up, Pair Up** (or another strategy) to assign partners.

 **STUDENTS DO:** Discuss shape placement with partner, and then cut and glue the quadrilaterals into the Venn diagram.

TEACHER DO: Walk around the room and observe students as they work. Ask probing questions such as:

- What shape or shapes do not fit into the diagram? Why not?
- Why does a square fit in the intersection?
- Can you think of a quadrilateral that is not on this sheet of shapes? What would it look like?

When 5 minutes are left in Learn, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: Let's discuss your work. I will use Calling Sticks to call on some of you. If I call your name, tell us the name of one quadrilateral, where you placed it, and why you placed it there.

 **STUDENTS DO:** Selected students describe where they placed each quadrilateral in the Venn diagram and explain thinking. Students with correct answers may draw and label shapes on the teacher's large Venn diagram.

TEACHER DO: Ask the whole group the questions you asked as you were circulating around the room. It is equally important for students to discuss why shapes do not fit a category as it is for them to discuss why shapes do fit.

 **STUDENTS DO:** Use what they have learned about quadrilaterals to explain and defend thinking.

TEACHER SAY: Great work today. I always learn so much listening to your thinking, and I enjoy hearing you use math vocabulary. Clean up all your materials for Reflect.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today we looked at a category of two-dimensional shapes called quadrilaterals. For Reflect, think about what you have learned about quadrilaterals. Take a minute and look around the classroom. Do you see examples of quadrilaterals? We will Popcorn to share where in the room we see quadrilaterals.**

TEACHER DO: Give 1 minute to look around the room. Then, if necessary, review **Popcorn**. Allow as many students as possible to share and name quadrilaterals they see in the classroom.

 **STUDENTS DO: Popcorn** to share the quadrilaterals that they see in the classroom, stating the name of the object and what type of quadrilateral it is.

TEACHER SAY: Everyone worked hard today. Keep noticing the shapes all around you, even at home.

Lesson 33 Overview

LESSON OVERVIEW

In this lesson, students create a picture using quadrilaterals and then graph the quantity of each shape they used. This activity allows students to confirm understanding of quadrilaterals and practice previously learned graphing skills. Students may work in groups, with partners, or individually depending on the size of your class and materials. The directions are written for partners; adjust them to suit your situation.

LEARNING OBJECTIVES

Students will:
- Apply rules to sort quadrilaterals.
- Combine quadrilaterals to create a picture.
- Create a bar graph representing quadrilaterals to create a picture.

LESSON PREPARATION FOR THE TEACHER

- Gather construction paper for pictures/designs (one sheet per pair of students).

KEY VOCABULARY

- Review vocabulary as needed.

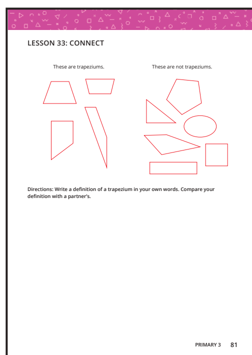
MATERIALS

- Construction paper (one sheet per pair of students)
- Scissors
- Glue
- Colored pencils or crayons
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. TEACHER SAY: **We have reviewed two-dimensional shapes together, and in our last math class we looked just at quadrilaterals. Please open your Mathematics Student Book to page Lesson 33: Connect.**

 STUDENTS DO: Open student book to page Lesson 33: Connect.

TEACHER SAY: **On this page, there is a grid that has trapeziums on one side and shapes that are not trapeziums on the other. Look at the images and try to write a definition of a trapezium in your own words. Then compare with your Shoulder Partner. In a few minutes, I will use Calling Sticks to select some of you to share your thinking.**

 STUDENTS DO: Use images in student book to develop a definition for trapezium. Share definition with **Shoulder Partner**. Selected students share thinking with the group.

TEACHER SAY: **I heard a lot of great mathematical thinking in your definitions. A trapezium is a quadrilateral because it has four sides, but only one set of sides are parallel. Show me with your arms what two parallel lines look like.**

 STUDENTS DO: Hold arms parallel in front of them or straight up and down.

TEACHER SAY: **Good work. Remember, the sides of quadrilaterals do not have to be an equal length. Let's look at quadrilaterals in a different way.**



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: Today you and a partner will create a picture to demonstrate your understanding of quadrilaterals. Your picture must have at least 12 quadrilaterals and at least one of each type we discussed these past few days. When you are finished, you will create a bar graph to show how many of each quadrilateral you used in your design. Let's prepare by doing a quick review. I will give you clues about a quadrilateral. Lean and Whisper the name of the quadrilateral to your Shoulder Partner.**

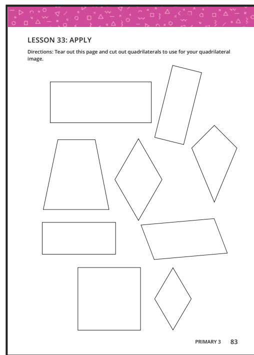
TEACHER DO: Give clues to a quadrilateral, such as:

- This quadrilateral has four sides and all sides can be different lengths. (Trapezium)
- This quadrilateral has four slanted sides (two sets of parallel sides) and two of the vertices look alike and the other two look alike. (Parallelogram or possibly rhombus)
- All of the sides of this quadrilateral are equal. (Square or rhombus)

Note to the Teacher: You do not need to review all the quadrilaterals. Parallelograms are new so be sure to review that quadrilateral. Allow students time to whisper to partner and then confirm as a group. If time allows, ask a student to give a clue to a quadrilateral for the group to guess.



STUDENTS DO: Lean and Whisper to partner the name of the quadrilateral. Selected students provide quadrilateral clues to the whole group.



TEACHER SAY: Wonderful. Now it is time to create your quadrilateral picture. Turn in your student book to page Lesson 33: Apply.



STUDENTS DO: Turn to page Lesson 33: Apply.

TEACHER SAY: Each of you will tear out this page. You will work with your Shoulder Partner to create a picture, so you have to work together to decide what your picture will be and which shapes you will use. You can use both of your pages or just one. Cut out the shapes you are using and glue them down on a sheet of construction paper to create your picture. You must use at least 12 shapes and at least 1 of each kind of quadrilateral we have learned about. Once you finish gluing your shapes down, add color and details to complete your picture. Finally, count the number of each shape used in your picture. Record the results on the bar graph in your student book on page Lesson 33: APPLY. Look at that page now and raise your hand if you have questions about the activity.



STUDENTS DO: Observe the bar graph page and raise hand to ask questions, if necessary. Begin working with a partner.

TEACHER DO: Hand out construction paper to each set of partners. As students work, walk around to observe how they work together to create the picture and bar graph. Remind students about the project requirements as needed.



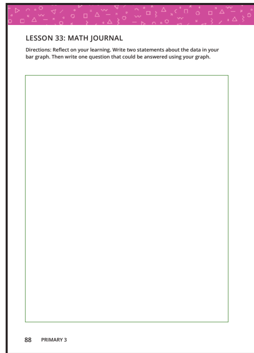
STUDENTS DO: Create a quadrilateral picture with partner. Once complete, create a bar graph in the book to show how many of each quadrilateral were used in the picture. Partners who finish early can add details to the picture.

TEACHER SAY: I saw so many of different pictures today, all with quadrilaterals. Put away all materials and bring your pictures to me to display in our classroom.



Reflect (5 to 10 minutes)

Directions


LESSON 33: MATH JOURNAL

Directions: Reflect on your learning. Write two statements about the data in your bar graph. Then write one question that could be answered using your graph.

88 PRIMARY 3

1. TEACHER SAY: **Your quadrilateral pictures look great. Please turn to page Lesson 33: Math Journal in your book. Look at your bar graph. Then write two statements about the data in your bar graph. Then write one question that could be answered using your graph.**

Note to the Teacher: Depending on students' readiness, have them work independently or with a partner.

 **STUDENTS DO:** Respond to prompt on the Math Journal page.

TEACHER DO: Give students 2 to 3 minutes to write about the graph. Be sure to collect students' books and review their work. The graph and Math Journal page can provide valuable information about students' understanding and progress.

Lesson 34 Overview

LESSON OVERVIEW

In this lesson, students explore the concept of area by designing a garden plot with small squares. They will later connect the concept of area to what they have learned about multiplication.

LEARNING OBJECTIVES

Students will:

- Use manipulatives to build rectangles with specified dimensions.
- Calculate the area of rectangles in square units.

KEY VOCABULARY

- Area
- Array
- Dimensions
- Square unit

LESSON PREPARATION FOR THE TEACHER

Prepare sets of small 2 cm × 2 cm squares (one set of 40 for each pair of students). See 2-CM Grid Paper Blackline Master. See Chapter Preparation for Lesson 34 for additional details.

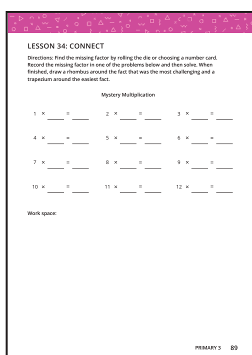
MATERIALS

- Number cards 0 to 12 or one die per partner group
- Sets of 2-centimeter squares (one set per pair of students)
- Scissors (optional)
- Paper or plastic bags (for storage of sets)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



LESSON 34: CONNECT

Directions: Find the missing factor by rolling the die or choosing a number card. Record the missing factor in one of the problems below and then solve. When finished, draw a rhombus around the fact that was the most challenging and a trapezium around the easiest fact.

Mystery Multiplication

1 × ____ = ____	2 × ____ = ____	3 × ____ = ____
4 × ____ = ____	5 × ____ = ____	6 × ____ = ____
7 × ____ = ____	8 × ____ = ____	9 × ____ = ____
10 × ____ = ____	11 × ____ = ____	12 × ____ = ____

Work space:

PRIMARY 3 89

1. TEACHER SAY: Today you will play Mystery Multiplication again to practice our multiplication facts. Please take out your Mathematics Student Book and turn to page Lesson 34: Connect. Play as you did the other day. Roll the die or take a card to identify the missing factor, record, and find the product.

TEACHER DO: Hand out one die or a set of number cards to **Shoulder Partners** to share and allow partners to play for 5 minutes. Walk around and observe which facts are easier for students to solve than others. After 5 minutes, bring the group back together.



STUDENTS DO: Roll the die, record the factor, and find the product. Repeat. If all the equations are completed and more time remains, have students order the products from least to greatest or greatest to least.

2. TEACHER SAY: Good work practicing your facts. Now look at the problems you solved. Draw a rhombus around the most challenging multiplication equation you solved today and put a trapezium around the easiest multiplication fact for you today.



STUDENTS DO: Draw a rhombus and trapezium around the easiest and most challenging equations.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Give each set of **Shoulder Partners** a set of 2 cm squares.

TEACHER SAY: For the past couple of math lessons, we have explored quadrilaterals. Today we are going to use two of them to explore a new math concept—area. Use the small squares to make a rectangle with your Shoulder Partner. You do not have to use all the squares. When you are done, give me a Thumbs Up.



STUDENTS DO: Work with a partner to create a large rectangle using the small squares. Give a **Thumbs Up** when finished.

TEACHER SAY: I see many different rectangles. Raise your hand if you would like to describe your rectangle and draw it on the board.

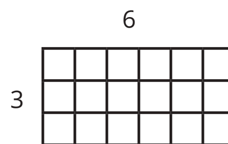
TEACHER DO: Call on two or three sets of partners who made different rectangles.



STUDENTS DO: Raise hand to volunteer. Selected partners explain the rectangle, stating the total number of rows, columns, and squares, and draw the rectangle on the board. Label the rows, columns, and total.

TEACHER DO: Assist students as needed.

TEACHER SAY: There are three different rectangles drawn on the board. We wrote the total number of squares for each one. We also wrote the DIMENSIONS, or how many rows and how many columns. (Example shown below.) Do these rectangles remind you of anything we have learned in math recently? Talk quietly with your Shoulder Partner and share your thinking.



Total number of squares = 18



STUDENTS DO: Share thinking with a **Shoulder Partner**.

TEACHER DO: If students do not recognize arrays in the rectangles, either ask questions to help them make the connection or explain it to them (to save lesson time).

TEACHER SAY: The rectangles you made from smaller squares look like arrays. _____ (Students' names) used _____ squares to make a rectangle. The rows and columns help us calculate how many squares are in the rectangle. The rows and columns are the factors. Mathematicians call the number of squares that fit inside a region the AREA. We call each square inside the rectangle a SQUARE UNIT.

TEACHER DO: Draw a thick line around the rectangles. Explain that the space inside the square is the AREA. Point to one of the rectangles and use it to help explain area.

TEACHER SAY: If I count the squares inside _____ (students' names) rectangle, I see that the area is _____ square units.

TEACHER DO: Use **Calling Sticks** to select students to find the area of the other two rectangles.



STUDENTS DO: Selected students find the area of rectangles on the board.

Note to the Teacher: Some students may recognize that the area is equal to the number of rows multiplied by the number of columns. Allow those students to explain and demonstrate thinking at the board. Having concepts explained by students is often helpful to children and can build the confidence of the students acting as teachers.

TEACHER SAY: Now let's look at this problem:
Sara wants to build a garden to plant pumpkins. Each pumpkin needs 1 SQUARE UNIT of space. Sara wants the garden to have 5 rows, with 3 pumpkins in each row.

TEACHER DO: Write on the board: 5 rows of pumpkins. 3 pumpkins in each row. 1 pumpkin in each square unit.

TEACHER SAY: Work with your Shoulder Partner and use your squares to build Sara's garden plot. Give me a Thumbs Up when you are finished.

STUDENTS DO: Work with **Shoulder Partner** to use small squares to build the described garden plot. Give a **Thumbs Up** when finished.

TEACHER SAY: All of you made a rectangular garden plot that has 5 rows with 3 in each. Lean and Whisper how many squares you used in all. How many pumpkins will be in Sara's garden?

STUDENTS DO: Lean and Whisper.

TEACHER SAY: Each rectangle used 15 squares, so there will be 15 pumpkins in Sara's garden. The AREA of this garden is 15 because the inside of the rectangle contains 15 square units. Now you are going to make more garden plots using your squares and some grid paper. Please open your student book to page Lesson 34: Apply.

STUDENTS DO: Open book to page Lesson 34: Apply.

TEACHER SAY: On this page, you will see some story problems about garden plots. There are grids on the next two pages that match your squares. Let's go over the directions together.

TEACHER DO: Read the directions aloud. Answer any questions students have about the learning task.

STUDENTS DO: Work with **Shoulder Partner** to read the problems, build rectangles, draw rectangles, and record the area. Students who finish early may work on the Challenge problems. Clean up squares when time is up.

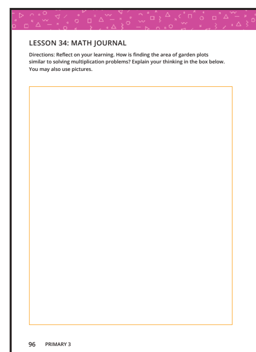
TEACHER DO: Walk around the room observing students as they build rectangles and find the area. Note students who may need extra support building or determining the area.

TEACHER SAY: Nice work building rectangular garden plots and finding the area of each rectangular plot. Keep out your student book for Reflect.



Reflect (5 to 10 minutes)

Directions


LESSON 34: MATH JOURNAL
Directions: Reflect on your learning. How is finding the area of garden plots similar to solving multiplication problems? Explain your thinking in the box below. You may also use pictures.
96 PRIMARY 3

1. TEACHER SAY: Today we explored building rectangles out of small squares and then determined the area. Think for a minute about how finding the area of the rectangles and multiplication are related. Write your answer in the box on page Lesson 34: Math Journal. You may include drawings to help you explain your thinking.

STUDENTS DO: Write a response to the prompt.

TEACHER DO: Allow 2 to 3 minutes for students to write a response to the prompt. Collect all student books and review students' responses. Take note of students who already show an understanding of the relationship between area, arrays, and multiplication as well as students who may need additional exploration and instruction.

Lesson 35 Overview

LESSON OVERVIEW

In this lesson, students again determine the area of a variety of rectangles. However, this time they will not use a physical model of unit squares. If you find some students need additional exploration and practice, consider having sets of the squares used in Lesson 34 available.

LEARNING OBJECTIVES

Students will:

- Determine the area of rectangles using strategies related to multiplication.

KEY VOCABULARY

- Area
- Array
- Product
- Square unit

MATERIALS

- Sets of 2-centimeter squares (optional)
- Mathematics Student Book and pencil

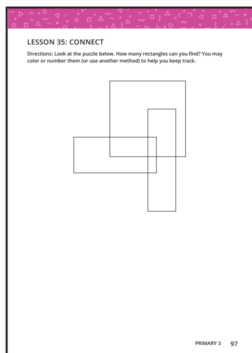
LESSON PREPARATION FOR THE TEACHER

- Draw a large version of page Lesson 35: Connect (in the student book) on the board before class.
- Prior to the lesson, draw a large 6×8 array (with all the squares shown) on the board. Do not label the dimensions.



Connect (10 to 15 minutes)

Directions



LESSON 35: CONNECT

Directions: Look at the puzzle below. How many rectangles can you find? You may color or number them (or use another method) to help you keep track.

PRIMARY 3 97

1. TEACHER SAY: **Let's look at a geometry puzzle called Overlapping Rectangles. Please open your Mathematics Student Book to page Lesson 35: Connect.**



STUDENTS DO: Open student book to page Lesson 35: Connect.

TEACHER SAY: **See how many rectangles you can find in the image in your book. In a few minutes, you will share your thinking.**



STUDENTS DO: Work independently to complete the task.

TEACHER DO: Give students about 3 minutes to work on the puzzle. Use **Calling Sticks** to select students to share thinking.



STUDENTS DO: Selected students share findings and show the rectangles they found on the board.

TEACHER SAY: **Great job. Keep out your student book for today's lesson.**



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Point to the array you drew on the board.

TEACHER SAY: In our last math class, you learned a new math word—area. Give me a Thumbs Up if you remember what area means in math.



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share their definition of area.

TEACHER SAY: Area means the number of square units that fit inside of a space. In our last class, we used squares to build rectangular gardens and find the area of those gardens. Today you will work to find the area of a garden plot that is already drawn for you. Let's look at the one I have drawn on the board.

TEACHER DO: Point to the large 6 × 8 array on the board.

TEACHER SAY: This garden plot has a lot of squares for our vegetables. Who can remind us how to find the area of this garden plot? Raise your hand if you know.



STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

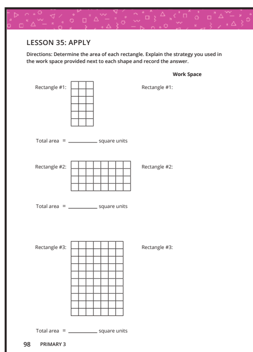
TEACHER DO: Accept all reasonable answers (for example, count the squares, multiply the rows by the columns, skip count by 6, and so on).

TEACHER SAY: Work with your Shoulder Partner to determine the area of this rectangle. Give me a Thumbs Up when you have the answer.



STUDENTS DO: Work with a partner to find the area of the rectangle. Give a **Thumbs Up** when finished. Selected partners share answers.

TEACHER DO: Call on partners to share an answer and the strategy used for determining the area. Try to identify pairs who used different strategies. Allow for multiple pairs to share strategies, record ideas for others to see.



LESSON 35: APPLY

Directions: Determine the area of each rectangle. Explain the strategy you used in the work space provided next to each shape and record the answer.

Work Space

Rectangle #1: Rectangle #1:

Total area = ________ square units

Rectangle #2: Rectangle #2:

Total area = ________ square units

Rectangle #3: Rectangle #3:

Total area = ________ square units

98 PRIMARY 3

TEACHER SAY: There are many different strategies for calculating the area of rectangles. Some strategies are fast and some take longer. Today you will work to find the area of rectangles. You may do that using any strategy that makes sense for you, but you must explain how you solved the problem. Take out your student book and turn to page Lesson 35: Apply.



STUDENTS DO: Take out book and turn to page Lesson 35: Apply.

TEACHER SAY: Use the work space next to each rectangle to show your thinking. Be sure to record your answer too.



STUDENTS DO: Spend the rest of the Learn time finding the area of rectangles, recording answers, and explaining the strategies they used. Students who finish early may do the Challenge.

TEACHER DO: Walk around the class observing students as they work. Note students who may still be using less efficient (but accurate) strategies, such as counting each box one by one. When Learn is almost over, use an **Attention Getting Signal** to bring the group back together. Collect student books to check students' understanding and to see what strategies they are using.

TEACHER SAY: As I walked around the room, I saw many different strategies being used. Nice job today. Please close your student book.



Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today you worked to find the area of shapes. Turn to your Shoulder Partner and explain the strategy you used for finding the total area of the rectangles. If you tried more than one strategy, be sure to explain all of them.**

 **STUDENTS DO:** Talk to a partner about the strategies they used for finding the area.

TEACHER DO: Allow a few minutes for students to share with partner. Use **Calling Sticks** to select a few students to share.

Note to the Teacher: As you review students' books, note any students who attempted or completed the Challenge problems. Set aside time to talk to them about the strategies they used and hear their thinking about how they approached the problems.

TEACHER SAY: **In our next class, we will continue to explore area. You did such great work today. Give your Shoulder Partner a high five.**

 **STUDENTS DO:** Give **Shoulder Partner** a high five.

Lesson 36 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students create and describe rectangles with different dimensions but the same area. They practice applying the Commutative Property to show how factors, as applied to area, can be written two ways.	Students will: • Create and describe multiple rectangles with the same area. • Explain and model the Commutative Property of Multiplication.	• Area • Columns • Commutative Property • Factors • Rows • Unit square

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, write on the board the story problem from Lesson 36: Connect (in the student book). Also, draw a large version of page Lesson 36: Connect (in the student book) on the board.

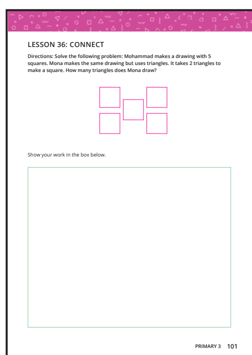
MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



LESSON 36: CONNECT

Directions: Solve the following problem: Mohammad makes a drawing with 5 squares. Mona makes the same drawing but uses triangles. It takes 2 triangles to make a square. How many triangles does Mona draw?

Show your work in the box below.

PRIMARY 3 101

1. **TEACHER SAY: Please open your Mathematics Student Book to page Lesson 36: Connect. Read and solve the problem.**



STUDENTS DO: Turn to page Lesson 36: Connect. Work independently to solve the problem.

TEACHER DO: Call on several students and take note of the strategies and explanations. Did they use drawings or skip counting?



STUDENTS DO: Selected students share answers and explain thinking.

TEACHER DO: If not presented by a student, model how to divide a square into 2 equal parts with a diagonal line.

TEACHER SAY: How many triangles would Miriam draw to make 10 squares? Turn and Talk to your Shoulder Partner.



STUDENTS DO: Discuss the question with a **Shoulder Partner**.

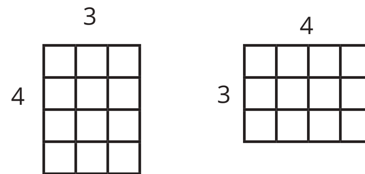
TEACHER DO: Call on students to share ideas. Check to see if students understand that the number of triangles is double the number of squares. If possible, allow a student to explain the concept to the rest of the class.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Draw the two rectangles below on the board (one rectangle with 4 rows and 3 columns and one rectangle with 3 rows and 4 columns).



TEACHER SAY: On the board are two rectangles. Whisper to your Shoulder Partner what the area of each rectangle is.

STUDENTS DO: Whisper answers.

TEACHER SAY: Both rectangles have 12 square units. But they are not exactly the same. How is that possible?

TEACHER DO: Use **Calling Sticks** to select students.

STUDENTS DO: Selected students share thinking.

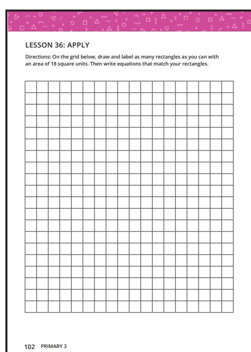
TEACHER DO: If necessary, explain that the rectangles have the same two numbers as their dimensions. They just have been rotated. Remind students that they saw this when they found all the ways to arrange 12 chairs.

TEACHER SAY: Lean and Whisper what the multiplication equations would be for each of these arrays.

STUDENTS DO: Whisper answers.

TEACHER SAY: Both equations have the same factors, 3 and 4. Two equations can be written—3 × 4 and 4 × 3—and you get the same product. The order does not matter. Raise your hand if you can recall what property that is.

STUDENTS DO: Raise hand to volunteer. Selected students share answers.



TEACHER DO: Make sure students understand that no matter the order of the factors, the product will be the same and that this is the Commutative Property of Multiplication.

TEACHER SAY: Please turn in your student book to page Lesson 36: Apply and read the directions to yourself.

STUDENTS DO: Turn to page Lesson 36: Apply and read the directions silently.

TEACHER SAY: Today you will create rectangles that look different but have the same area. Each rectangle must have an area of 18 square units.

TEACHER DO: If possible, relate the activity to a career or concept that students have learned about. For example, area is used in gardening, laying floor tile, painting walls, purchasing rugs, and so on.

TEACHER SAY: Remember, your job is to see how many different rectangles you can create with this area. After you draw all of your rectangles, write equations that represent each one. Who can tell me how to do that? Raise your hand.

STUDENTS DO: Raise hand to volunteer. Selected students explain how to use the dimensions of the rectangles to identify the factors in the equations.

TEACHER SAY: Great explanations. You may begin working. If you finish early, you can try the challenge questions at the bottom of the page.

 **STUDENTS DO:** Work independently to complete the Apply learning activity.

TEACHER DO: As students work, walk around and take note of the strategies they use to solve the problems. Note students who are immediately able to apply the Commutative Property to create rectangles and identify dimensions/factors. For example, when they create a 6 × 3 rectangle, do they also see that they can draw a 3 × 6 rectangle, or does this still require more thought?

Toward the end of Learn, use an **Attention Getting Signal** to call students together and go over the answers together. Use this time to reinforce the Commutative Property by having students discuss two rectangles with the same dimensions but with the number of rows and columns swapped, such as a 3 × 4 rectangle and a 4 × 3 rectangle. Ask questions to help students recognize the connection between this activity and when they arranged chairs in Theme 1.

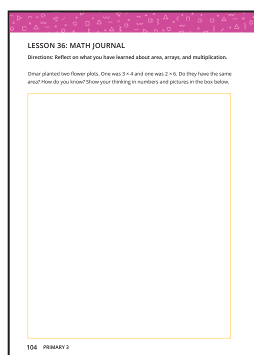
TEACHER SAY: You did good work creating different arrays that all had the same area. Clean up for Reflect but keep out your student book.

 **STUDENTS DO:** Clean up materials for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 36: MATH JOURNAL

Directions: Reflect on what you have learned about area, arrays, and multiplication.

Omar planted two flower plots. One was 3 × 4 and one was 2 × 6. Do they have the same area? How do you know? Show your thinking in numbers and pictures in the box below.

104 PRIMARY 3

1. **TEACHER SAY: Please open your student book to page Lesson 36: Math Journal.**

 **STUDENTS DO:** Turn to page Lesson 36: Math Journal.

TEACHER DO: If necessary, read the journal prompt aloud or select a student to do so.

 **STUDENTS DO:** Work independently to respond to the journal prompt.

TEACHER SAY: Great job today solving area problems. Area is a part of our daily lives. If we are purchasing a rug, creating a football field, sewing a blanket, painting a wall, building a garden, or laying tiles on a floor, we need to understand area.

Lesson 37 Overview

LESSON OVERVIEW

In this lesson, students deepen their understanding of area by exploring rectangles and squares where part of the grid is no longer seen and exploring how the dimensions can help determine the area. They will define area in their own words and think about real-world applications of area.

Determining area without the grids will be challenging for many students, especially those who rely on counting each square one by one. However, removing part of the array pushes students to think about the dimensions and how those numbers represent the number of squares in the rows and columns. It is all right if students still need to draw in all the squares, but some may jump to multiply length times width to find the area and will develop an understanding of the formula for area of a square or rectangle. To build deep conceptual understanding, the tasks have been scaffolded—students first use actual squares, then count each square, then calculate area with some squares removed.

LEARNING OBJECTIVES

Students will:

- Define area in their own words.
- Apply strategies to measure area.

KEY VOCABULARY

- Area
- Columns
- Commutative Property
- Dimensions
- Rows

LESSON PREPARATION FOR THE TEACHER

Prepare sets of number cards 1 to 10 (one set per student). See the Number Cards 0–12 Blackline Master.

Prior to the lesson, draw a rectangle on the board that shows only some squares. See Chapter Preparation for Lesson 37 for detailed instructions.

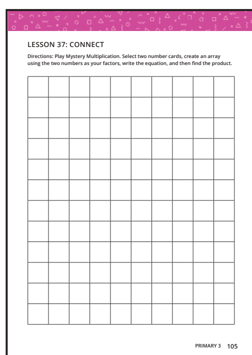
MATERIALS

- Number cards 1 to 10
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. TEACHER SAY: Today for Connect we will play Mystery Multiplication. Please open your Mathematics Student Book to page Lesson 37: Connect. Instead of identifying one factor, we will identify both factors by turning over two number cards.

TEACHER DO: Model how to play the game. Turn over two cards to identify the factors, draw the array, write the equation, and solve the problem. For example: If one card is a 3 and the other card is a 5, model how to draw the array on the board either as a 3×5 or a 5×3 array, write the equation $3 \times 5 =$ ______, and then model counting the squares or counting by 5s to find the product. Finally, finish by writing $3 \times 5 = 15$ on the board. Have students begin working.



STUDENTS DO: Work independently in the book.

TEACHER DO: At the end of Connect time, ask students to share with a **Shoulder Partner** at least one strategy they have learned for solving area problems.



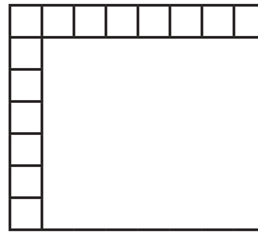
STUDENTS DO: Describe to a **Shoulder Partner** at least one strategy they use to solve area problems.



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Draw the following rectangle on the board.



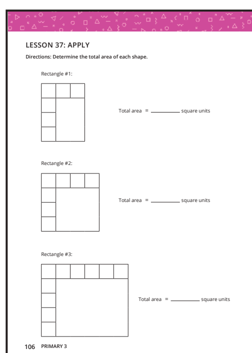
TEACHER SAY: In our last class, we looked at rectangles that had the same area. Today our objective is to be able to explain area in our own words and figure out how we can determine the area of any rectangle. Up until now, we have been able to use a grid or squares to help us calculate area, but what if the rectangle looked like the one on the board? Turn to your Shoulder Partner and discuss how you would determine the area of the whole rectangle. Give me a Thumbs Up to share your strategy and your answer.



STUDENTS DO: Talk to a **Shoulder Partner** about how to determine the area. Selected students share answers and explain thinking.

TEACHER DO: Allow students 2 to 3 minutes to discuss strategies. Then select two or three students to share strategies and answers and explain thinking. Allow students to draw on the rectangle on the board, if needed. Ask questions to help students recognize that they can identify the dimensions of the rectangle using the number of rows and columns.

TEACHER DO: Summarize students' explanations to ensure that all students understand different strategies to determine the area.


LESSON 37: APPLY

Directions: Determine the total area of each shape.

Rectangle #1:

Total area = ________ square units

Rectangle #2:

Total area = ________ square units

Rectangle #3:

Total area = ________ square units

106 PRIMARY 3

TEACHER SAY: Good job. Even if we do not have all the squares, we can use the dimensions of the rectangle—the number of rows and columns—to calculate the area. Please open your student book to page Lesson 37: Apply and read the directions to yourself.



STUDENTS DO: Turn to page Lesson 37: Apply and read the directions silently.

TEACHER SAY: On this page, you will see rectangles that look like the shape we just worked on together. Your job is to work with your Shoulder Partner to determine the total area of each of these shapes. You can draw on your page or use any strategy we tried with the example on the board. If you finish early, try the Challenge problems.



STUDENTS DO: Work with **Shoulder Partner** to determine the total area of the shapes in the student book. Students who finish early may work on the Challenge.

TEACHER DO: As students work, walk around the class to observe the strategies students are using to solve the problems. Listen to the conversations they are having with partners. This learning task is a great opportunity to determine which students may need additional instruction and practice. Ask questions such as the following to promote students' thinking:

- How can the numbers on the side (dimensions) help you figure out how many squares are inside the shape, and therefore find the area?
- Can you determine how many squares are inside without drawing them in?

When Learn is almost over, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: Great work finding the area of these shapes. It was wonderful to hear your mathematical thinking as I walked around the room. Keep your book out.



Reflect (5 to 10 minutes)

Directions

LESSON 37: MATH JOURNAL

Directions: Reflect on what you have learned about area. Then answer the following questions using words and pictures.

How would you explain area to a younger friend? Write your answer below.

How do you determine the area of a rectangle? Write your answer below.

When might you need to find the area of a rectangle in real life? Write your answer below.

PRIMARY 3 109

1. TEACHER SAY: **Turn in your student book to page Lesson 37: Math Journal.**

 STUDENTS DO: Turn to page Lesson 37: Math Journal.

TEACHER DO: Select students to read each prompt aloud.

 STUDENTS DO: Selected students read the prompts aloud. All students respond to the prompts.

TEACHER DO: Give 2 to 3 minutes for students to write answers to the prompts. Collect student books to read responses. This Reflect can serve as a means of determining student understanding of area and how to measure it.

TEACHER SAY: **Nice work today. Bring your student book to me and put away any supplies. Then give yourself a pat on the back.**

 STUDENTS DO: Give student book to the teacher. Give themselves a pat on the back.

Lesson 38 Overview

LESSON OVERVIEW

In this lesson, students being to explore the Distributive Property of Multiplication. Students investigate how they can break large arrays into smaller pieces, making them easier to work with. In this lesson, students maintain one dimension of the array and split the other dimension. For example, a 6 × 7 array could become (5 × 7) + (1 × 7) or (3 × 7) + (3 × 7). Students begin the exploration using visual models but will later use this strategy as a mental tool for solving more challenging area problems.

Note to the Teacher: This lesson focuses on the computational thinking concept of decomposition, which is about breaking down data, processes, or problems into smaller manageable chunks.

LESSON PREPARATION FOR THE TEACHER

- Have available one ruler for teacher use during Connect.
- Prior to the lesson, write the following story problem on the board:
  - Adham creates a rectangle with an area of 6 square centimeters. Soliman creates a rectangle with an area of 6 square millimeters. Do the two rectangles have the same area? Why or why not?
- Prior to the lesson, draw arrays on the board. See Chapter Preparation for Lesson 38 for details.

LEARNING OBJECTIVES

Students will:
- Divide arrays into smaller arrays to solve multiplication problems.
- Explain why dividing arrays makes it easier to solve multiplication problems.

KEY VOCABULARY

- Arrays
- Columns
- Factors
- Rows

MATERIALS

- One ruler
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Direct students' attention to the story problem on the board. Ask a student to read the problem aloud. Assist as needed.

 **STUDENTS DO:** Selected student reads the problem aloud.

TEACHER SAY: Do the two rectangles have the same area? Why or why not? You will have a minute to think about the problem and then a minute to share your thinking with your Shoulder Partner. I will use Calling Sticks to hear from some of you.

TEACHER DO: Give students one minute to think quietly and then another minute to talk to a **Shoulder Partner**.

 **STUDENTS DO:** Think quietly about the area problem and then share thinking with a partner. Selected students share thinking with the whole group.

TEACHER SAY: Let's double-check our thinking by using a ruler to draw both rectangles. Raise your hand if you can tell me two factors that could make a rectangle with area of 6 square units.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share the factors and then draw the rectangles on the board in centimeters and millimeters.

Note to the Teacher: This is a good opportunity to have students to make a connection between this learning activity and what they have learned about measuring length. Do not spend more than a couple minutes on the following question, but allow students to discuss the challenges of drawing rectangles in millimeters (if they are even able to do it).

TEACHER SAY: Which unit of measurement was easier to work with? Why?

TEACHER DO: Use **Calling Sticks** to select students to share thinking. Students should note that drawing rectangles in millimeters is more difficult since the units are very small.

 **STUDENTS DO:** Selected students share thinking.

TEACHER SAY: In the real world, people measure the area of rectangles with standard square units of measurement like square millimeters, square centimeters, or square meters. We could even measure the area of very large spaces using square kilometers. Using and naming the correct units matters. Think for a moment about if we wanted to cover the entire classroom floor with carpet. Imagine the total area was 36 square units. Do you think we should measure in centimeters or meters? Why? What would happen if you were unsure and trying to lay carpet? Talk to your partner for a moment. Raise your hand if you have an idea to share and can explain your thinking.

 **STUDENTS DO:** Raise hand to volunteer. Selected students answer the question and explain thinking.

TEACHER DO: Call on several students to share answers and explain thinking. If time allows, ask students for other examples of when units for area matter.

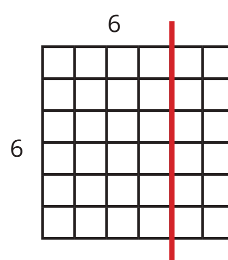


Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: Today we will learn the strategy of breaking apart arrays to find the area, especially when we are working with large arrays. We can apply that same strategy when solving multiplication problems. Breaking a multiplication problem into two or more parts can make the problem easier to solve. There is more than one correct way to break apart an array. I have a 6 × 6 array on the board with 36 square units. Let's take a look at one way to break this array into two easier area problems.**

TEACHER DO: Direct students' attention to the 6 × 6 array on the board. Draw a line after the fourth column of squares in the first array. Point to the different parts of the array.



TEACHER SAY: Now I have two arrays—a 6 × 4 array and a 6 × 2 array. If I solve the multiplication problems for the two new arrays and add their products together, would I still get 36 square units, the area of the original array? Raise your hand to share your thinking.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share thinking and explain how they know the total area is the same.

TEACHER SAY: So if I am unsure what 6 × 6 equals, I can break it into smaller arrays that are easier to multiply and then add the products back together to find the product of 6 × 6. Let's look at what that looks like as multiplication problems.

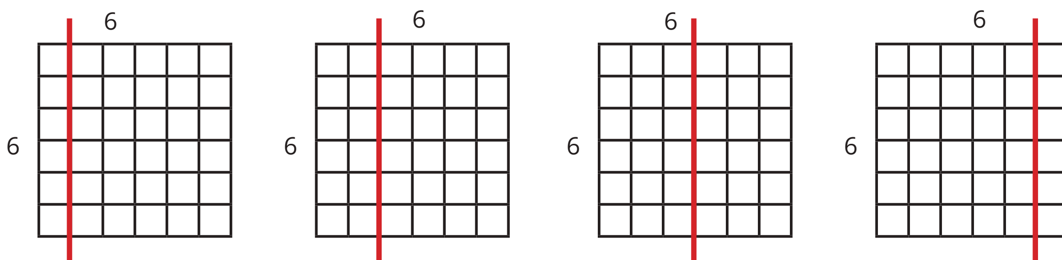
TEACHER DO: Write the following on the board: (6 × 4) + (6 × 2) = 36. Explain how the problem matches the image on the board.

TEACHER SAY: Can you think of another way a 6 × 6 array could be broken apart? Where else could we draw the line? Turn and Talk to your Shoulder Partner. Give me a Thumbs Up when you are ready.



STUDENTS DO: Talk to partners about the problem. Give a **Thumbs Up** when they are ready. Selected students share thinking and draw lines on the board to illustrate answers.

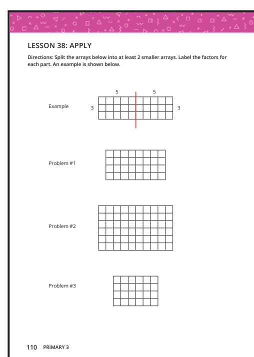
TEACHER DO: Help students identify the following as possible options:



TEACHER SAY: Which one would you do to find the area? Which one makes the work a little easier? Give me a Thumbs Up if you have idea.



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share thinking and explain reasoning.



LESSON 38: APPLY

Directions: Split the arrays below into at least 2 smaller arrays. Label the factors for each part. An example is shown below.

Example

Problem #1

Problem #2

Problem #3

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TEACHER DO: Take note of students who recognize that dividing the array in half means they only have to solve one multiplication problem.

TEACHER SAY: Please open your Mathematics Student Book to page Lesson 38: Apply. In your book, you have three larger arrays. Your job is to break them apart into smaller arrays to make them easier to solve. Be sure to label the factors. What questions do you have?



STUDENTS DO: Ask questions, if needed. Work independently in the student book.

TEACHER DO: As students work, walk around and see if students can split the larger arrays into smaller ones. Take note of students who split the same arrays into different dimensions. For example, one student may have split the first array into 4 × 4 and 4 × 4, while another student may have split it into 4 × 6 and 4 × 2. Ask students questions to promote mathematical thinking and discussion, such as:

- How did you decide to break your array apart?
- Did you use multiplication facts to help you decide where to split the arrays?
- Can you think of another way to break apart this array?

TEACHER SAY: Let's go over some of the ways you broke apart your larger arrays. Leave your work on your desk and we will take a Gallery Walk to share our work. As you look at your friends' work, see if they split the arrays the same way you did or in a different way.



STUDENTS DO: Take a **Gallery Walk** to see and compare their work to others.

TEACHER DO: Select several students' work to show and share with the class. Have these students explain how they broke the arrays apart using the language "I have one __ x__" , and so on. Ask them probing questions about how the way they broke arrays apart might help them solve the problem. For example, did they use 2 as a factor because they know their 2s facts? How does knowing multiplication facts help them solve the array problems?



STUDENTS DO: Selected students share work and explain thinking.

TEACHER SAY: Great job breaking apart arrays into smaller parts that are easier to solve. Keep your book out for Reflect.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: How can breaking up arrays help you find products more easily? Turn and Talk to your Shoulder Partner about what worked well for you today when breaking apart arrays. Explain your thinking using your work in your student book. I will give you 2 to 3 minutes. Then I will use Calling Sticks to select some of you to share your thinking.**



STUDENTS DO: Share thinking with each other. Selected students describe to the whole group what worked well for them and explain thinking, using examples if helpful.

TEACHER DO: Check to see if students are beginning to find strategies that work well for them. For example, if they feel most comfortable with 2s facts, are they breaking arrays apart in ways that facilitates this comfort?

TEACHER SAY: Nice work today. You may not have known it, but you were working with another property of multiplication today. We will learn more about it in our next math lesson. Please put away your materials.



STUDENTS DO: Put away materials.

Lesson 39 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students continue to explore the Distributive Property of Multiplication. They continue to make connections between multiplication, multiplication facts, and arrays and begin to use mathematical terminology to name and describe the property.	Students will: • Model the Distributive Property of Multiplication using arrays. • Apply the Distributive Property to solve multiplication problems. • Explain the Distributive Property of Multiplication.	• Distributive Property

MATERIALS

- Number cards 1 to 10 (one set per pair of students)
- Mathematics Student Book and pencil

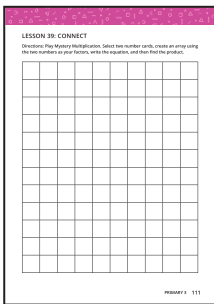
LESSON PREPARATION FOR THE TEACHER

- Have available sets of number cards 1 to 10 (one set per pair of students).
- Prior to the lesson, draw two 5 × 6 arrays on the board.



Connect (10 to 15 minutes)

Directions



1. TEACHER SAY: Turn to page Lesson 39: Connect in your Mathematics Student Book and read the directions to yourself.



STUDENTS DO: Turn to page Lesson 39: Connect and silently read the directions.

TEACHER DO: Review how to play Mystery Multiplication for Connect, if needed. Distribute number cards to each pair of **Shoulder Partners**.



STUDENTS DO: Play Mystery Multiplication to practice drawing and solving multiplication problems with arrays.

TEACHER DO: After about 10 minutes, have students stop playing and return the number cards.

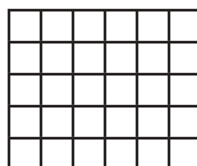


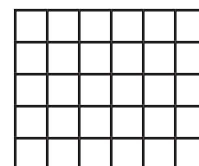
Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Yesterday we practiced breaking arrays apart into smaller pieces. If we take an array and divide it into two smaller pieces, it makes it easier to figure out how many squares are in the array. That works because of the Distributive Property of Multiplication. Let's take a look at how the DISTRIBUTIVE PROPERTY of Multiplication works.

TEACHER DO: Draw students' attention to the two arrays on the board.





TEACHER SAY: Raise your hand if you can tell me the dimensions of these two arrays.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share answers.

TEACHER SAY: Both of these squares have 5 rows and 6 columns. We could say they both have dimensions of 5 by 6. How many squares are there in the first array? Raise your hand if you know.

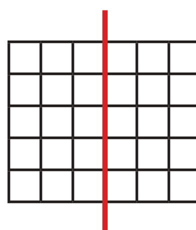
 **STUDENTS DO:** Raise hand to volunteer. Selected student shares answer.

TEACHER DO: Write 5 × 6 = 30 under the first array.

TEACHER SAY: We can also use the Distributive Property of Multiplication to figure out how many squares are in an array, especially if it is a large array. Give me a Thumbs Up if you have an idea where we could split this second array into two smaller arrays. Where could we draw a line?

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected student draws a line to divide the second array.

TEACHER DO: Ask students to help you identify the dimensions of the two new, smaller arrays. Write the two new multiplication problems under the second array (or have student volunteers do it). For example, if the array is divided as shown below, you would write 3 × 5 and 3 × 5 OR 5 × 3 and 5 × 3.



TEACHER SAY: Raise your hand if you know the product of the first problem.

 **STUDENTS DO:** Raise hand to volunteer. Selected student writes the answer on the board.

TEACHER DO: Repeat for the second problem.

TEACHER SAY: Now we know the products for the two smaller arrays, but if we want to know the product for the whole array, we have to add the two products together. Give me a Thumbs Up if you can do that.

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected student writes the sum of the two products on the board.

TEACHER DO: Model how to write the equation as follows (be sure to use the numbers students used):

- (5 x3) + (5 × 3)
- (15) + (15) = 30
- 5 × 6 = 30

TEACHER SAY: The sum of the two products is 30 (using the example arrays above). Does that match what we wrote for the first array?

 **STUDENTS DO:** Call out response.

TEACHER SAY: Great work. The DISTRIBUTIVE PROPERTY tells us we can divide a multiplication problem into two smaller problems, add together their products, and get the final answer. Let's practice this more together.

TEACHER DO: If students understand how to write the equation, have them work with a **Shoulder Partner** to solve the problems in the student book. If students are not ready to work independently, continue to work together to solve the problems in the student book. If students are working independently, be sure to walk around the room to see how they are solving problems. Note whether or not they can write the equation and listen carefully to the conversations they are having

with partners about the work. Conclude the lesson by asking students to explain the Distributive Property of Multiplication in their own words.

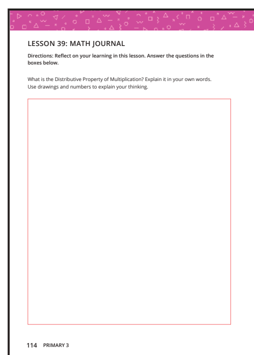


STUDENTS DO: Selected students explain the Distributive Property of Multiplication in their own words.



Reflect (5 to 10 minutes)

Directions



LESSON 39: MATH JOURNAL

Directions: Reflect on your learning in this lesson. Answer the questions in the boxes below.

What is the Distributive Property of Multiplication? Explain it in your own words. Use drawings and numbers to explain your thinking.

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1. **TEACHER SAY: You did a great job today exploring the Distributive Property of Multiplication. For Reflect, please turn to page Lesson 39: Math Journal and answer the questions. Raise your hand if you would like to read one of the questions aloud.**



STUDENTS DO: Turn to page Lesson 39: Math Journal. Raise hand to volunteer. Selected students read aloud the Math Journal questions. All students record ideas in the Math Journal.

TEACHER DO: Collect student work at the end of the class and read through journal entries to assess students' current level of understanding of the Distributive Property of Multiplication. Be sure to address misconceptions and misunderstandings during the next math class' Connect.

Lesson 40 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In today's lesson, students break apart arrays in multiple ways. This lesson asks students to be metacognitive—to think about their own thinking—and consider ways they can help themselves to be better mathematicians.	Students will: • Apply the Distributive Property to solve multiplication problems. • Reflect on understanding of multiplication and the Distributive Property of Multiplication.	• Arrays • Distributive Property • Metacognition

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, write the Connect math problem on the board.
- Gather colored pencils or crayons (each student needs several different colors).

MATERIALS

- Colored pencils or crayons (each student needs several different colors)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Read aloud the following problem.
If I want to solve 6 × 9, which of the following will NOT help me. Why not?

- (6 × 6) + (6 × 3)
- (6 × 4) + (6 × 4)
- (6 × 7) + (6 × 2)

TEACHER SAY: **Please use what you know about the Distributive Property to answer the problem on the board. Keep your answer to yourself for now.**

 **STUDENTS DO:** Read and solve the problem silently.

TEACHER DO: Use an **Attention Getting Signal** and then ask students to share thinking with a **Shoulder Partner**.

 **STUDENTS DO:** Share thinking with a **Shoulder Partner**.

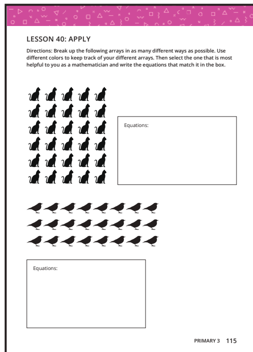
TEACHER DO: Allow 1 to 2 minutes for students to discuss the problem and then call on students to share. This is a challenging error analysis problem.

 **STUDENTS DO:** Selected students share answers and explain thinking, drawing arrays and modeling the problem as needed.



Learn (35 to 45 minutes)

Directions


LESSON 40: APPLY

Directions: Break up the following arrays in as many different ways as possible. Use different colors to keep track of your different arrays. Then select the one that is most helpful to you as a mathematician and write the equations that match it in the box.

Equations:

Equations:

PRIMARY 3 115

1. **TEACHER SAY: Today you will take all that you know about the Distributive Property and arrays and apply it in different ways to see how it can help you solve multiplication problems. Please open your Mathematics Student Book to page Lesson 40: Apply.**

 **STUDENTS DO:** Open student books to page Lesson 40: Apply.

TEACHER SAY: In your student book, there are some animal arrays. Your challenge is to break up these animal arrays in as many ways as you can think of. Each time you draw a line to create two new arrays, you will use a different color. That will help you keep track of them. When you have finished breaking them apart, think about which new array is the most helpful for you. Once you decide which array works best for you, write the equations to the side of the array. For example, maybe I first break an 8 by 8 array into a 4 by 8 array and a 4 by 8 array, and then I break it into a 6 by 8 array and a 2 by 8 array. For me, the 4 by 8 arrays help me more because I just need to solve one multiplication problem, and I know the answer to 4 times 8.

TEACHER DO: Model the above example, verbally explain your selection process and thinking. Hand out colored pencils or crayons (or have students take them out). Be sure to ask students what questions they have about the directions.

 **STUDENTS DO:** Ask clarifying questions, if needed.

TEACHER SAY: Please begin.

 **STUDENTS DO:** Work independently to solve the problems. Apply understanding of the Distributive Property of Multiplication to solve complex multiplication problems. Identify strategies that work best for them.

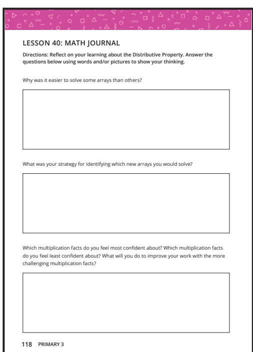
TEACHER DO: Walk around the room to see how students are solving problems. Note whether or not they can come up with different ways to break arrays apart and ask them about the equations they are writing. How did they make a decision about what way was the most helpful? At the end of Learn, use and **Attention Getting Signal**.

TEACHER SAY: As I walked around the room today, I saw many interesting strategies. I like hearing about how you are applying your learning. Please keep out your student book for Reflect.



Reflect (5 to 10 minutes)

Directions


LESSON 40: MATH JOURNAL

Directions: Reflect on your learning about the Distributive Property. Answer the questions below using words and/or pictures to show your thinking.

Why was it easier to solve some arrays than others?

What was your strategy for identifying which new arrays you would solve?

Which multiplication facts do you feel most confident about? Which multiplication facts do you feel least confident about? What will you do to improve your work with the more challenging multiplication facts?

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1. **TEACHER SAY: Please turn to page Lesson 40: Math Journal and read the questions silently.**

 **STUDENTS DO:** Open student book to page Lesson 40: Math Journal and read the questions silently.

TEACHER DO: Use **Calling Sticks** to select students to read the questions aloud.

 **STUDENTS DO:** Selected students read the journal prompts aloud. All students work independently to answer the questions.

TEACHER DO: At the end of Reflect, get students' attention.

TEACHER SAY: Having strategies to help break down multiplication problems into facts you know is a powerful tool. Metacognition is also a powerful tool. METACOGNITION is thinking about your own thinking. It means you can understand why you choose to solve problems using a certain strategy. It can also mean knowing what you know and what you still need to work on. Great job today.

PRIMARY 3

Mathematics

THE WORLD AROUND US

TAKING CARE OF OUR WORLD

Chapter 5

Lessons 41 to 50

Chapter Overview

Chapter 5 : Lessons 41 to 50

Chapter Overview:

In Theme 2, Connect includes an increased focus on fluency practice. Students will have more opportunities to practice computational skills and to master math facts. To facilitate this practice, a list of possible activities is included. Although Connect includes some recommended games or fluency-building activities, you are encouraged to select activities that meet the needs of your students.

The Connect segment will still include either a lead-in problem to the day's lesson or a challenging task or problem that encourages students to notice patterns and make connections. These usually occur on a day where more time is needed to explore the concept that is taught in Learn.

The major theme of this chapter is the perimeter and area of polygons. Students distinguish between perimeter as a linear measurement and area as a non-linear (or square) measurement. Students calculate both measurements with a variety of strategies and compare shapes with the same perimeter and different areas as well as shapes with different perimeters and the same area. As students continue to work with these measurements, the goal is for them to develop a strong understanding of how to find area. Some students may still rely on counting individual squares within the polygon while others will try repeated addition. Additional practice with area will also develop students' understanding of and fluency with multiplication facts. In the final lesson of this chapter, students return to a study of patterns in multiplication. They multiply by 10 and multiples of 10. This study continues in Chapter 6.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 41 to 50, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.c. Multiply and divide within 100.

1.d. Use strategies to solve multiplication and division problems, including:

1) Manipulatives
2) Drawings
3) Arrays
4) The relationship between multiplication and division

C. NUMBERS AND OPERATIONS IN BASE TEN:

2.b. Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 (for example, 3 × 50, 6 × 30) using strategies based on place value and properties of operations.

D. MEASUREMENT AND DATA:

5.a. Identify area as an attribute of plane figures.

5.b. Use non-standard measurements to calculate the area of a figure in whole numbers.

5.c. Apply concepts of area measurement:

1) A square with a side length of 1 unit is said to have "one square unit" of area. This unit can be used to measure area.

5.e. Relate area to the operations of multiplication and repeated addition:

1) Find the area of a rectangle with × square units.
2) Find the area of a rectangle with whole-number side lengths using concrete models.
3) Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems.

5.f. Solve real-world and mathematical problems involving perimeters of polygons, including:

1) Finding the perimeter given the side lengths.
2) Drawing rectangles on a grid with the same perimeter and different areas or with the same area and different perimeters.

Computational Thinking

Throughout Lessons 41 to 50, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

D. MEASUREMENT AND DATA:

5.e. Relate area to the operations of multiplication and repeated addition.

5.f. Solve real world and mathematical problems involving perimeters of polygons.

CH 5 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
41	Students will: • Measure the lengths of sides of polygons in centimeters. • Define perimeter. • Calculate the perimeter of polygons in centimeters. • Explain why perimeter is a linear measurement.
42	Students will: • Distinguish between polygons and non-polygons. • Calculate the perimeter of polygons in centimeters. • Describe practical applications for measuring perimeter.
43	Students will: • Estimate the perimeters of polygons in centimeters. • Measure the lengths of sides of polygons in centimeters. • Calculate the perimeter of polygons in centimeters. • Explain how to calculate perimeter of polygons.
44	Students will: • Explain the difference between perimeter and area. • Calculate the perimeter and area of given arrays with some units missing.
45	Students will: • Explain why area is not a linear measurement. • Calculate the area of a rectangle given only the length and width. • Describe the problem-solving strategies they used to solve area problems.
46	Students will: • Apply a variety of strategies to solve area problems. • Explain the strategies they used to solve area problems.
47	Students will: • Construct different rectangles with the same area. • Compare the perimeters of rectangles with the same area but different dimensions.
48	Students will: • Construct different rectangles with the same perimeter. • Compare the areas of rectangles with the same perimeters but different dimensions.
49	Students will: • Apply strategies to solve real-world area and perimeter problems. • Apply their understanding of area and perimeter to write story problems.
50	Students will: • Multiply by 10 and multiples of 10. • Identify and explain patterns observed when multiplying by 10s.

Chapter Preparation for Teacher

For Lesson 41:

- Cut 30 cm pieces of string (four pieces per pair of students).
- Gather centimeter rulers and scissors (at least one per pair of students).
- Prior to the lesson, draw a large version of the Apply page on the board or on chart paper.
- Prior to the lesson, write the Mystery Polygon clues below on the board or on chart paper.

Mystery Polygon 1
I have four vertices.
I have four sides.
Two of my sides are longer than the other two.
What polygon am I?

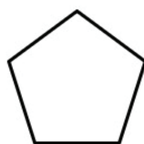
Mystery Polygon 2
I have four sides.
One of my sides is longer than the other three.
Two of my vertices are narrow and two are wide.
What polygon am I?

For Lesson 42:

- Prior to the lesson, draw on the board or on chart paper the shapes that appear on page Lesson 42: Connect in the Mathematics Student Book.
- Gather glue (one per pair of students).
    - Students will also need the centimeter rulers and scissors they used in Lesson 41.

For Lesson 43:

- Prior to the lesson, draw the shapes below on the board.




    - Pentagon: Each side should measure 10 cm.
    - Parallelogram: Long sides should measure 20 cm. Short sides should measure 8 cm.
    - Do not label the side lengths.
- Prepare sets of number cards 0 to 12 (one set per student).

For Lesson 44:

- Prior to the lesson, draw a 4 × 6 array on the board.
    - Make the outside edges a little darker than the inside lines to highlight the perimeter of the shape.

For Lesson 45:

- Prior to the lesson, draw on the board one 4 × 7 rectangle and one 5 × 7 rectangle.
    - For each rectangle, label the dimensions of one long side and one short side.
    - Do not draw lines inside the rectangles.

For Lesson 47:

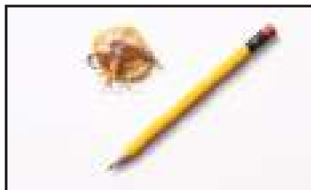
- Prepare sets of 50 counters (one set per pair of students). Examples of counters include dried beans, small stones, teddy bear counters, two-sided counters, or pieces of dried pasta.
- Print out four copies of the Perimeter and Area Squares Blackline Master (32 squares total). Alternatively, draw and cut out 32 squares with sides of at least 8 centimeters.

Materials Used

Student book



Pencil



String



Scissors



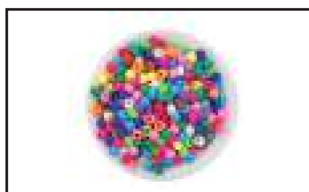
Centimeter rulers



Glue



Counters



Number cards

120 Chart

Squares

Thinking like a mathematician chart

Lesson 41 Overview

LESSON OVERVIEW

Students begin this lesson by solving a Mystery Polygon problem to help them review attributes of polygons. During Learn, they review linear measurement by measuring in centimeters the side lengths of a variety of quadrilaterals. Students are introduced to perimeter and use string to the concept of perimeter as a linear measurement.

LEARNING OBJECTIVES

Students will:

- Measure the lengths of sides of polygons in centimeters.
- Define perimeter.
- Calculate the perimeter of polygons in centimeters.
- Explain why perimeter is a linear measurement.

KEY VOCABULARY

- Attributes
- Centimeters (cm)
- Cm
- Height
- Length
- Linear measurement
- Perimeter
- Polygon
- Quadrilateral
- Width

LESSON PREPARATION FOR THE TEACHER

- Cut 30 cm pieces of string (two pieces per pair of students).
- Gather centimeter rulers and scissors (at least one per pair of students).
- Prior to the lesson, draw a large version of the Apply page on the board or on chart paper.
- Prior to the lesson, write the mystery clues on the board or on chart paper so students can see them. See Chapter Preparation for Lesson 41 for details.

MATERIALS

- Thinking Like a Mathematician chart
- Sets of cut string (one set per pair of students)
- Scissors (one per pair of students)
- Centimeter rulers (one per pair of students)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: **What is a polygon? Turn and tell your Shoulder Partner, and when you have a good definition, give me a Thumbs Up.**



STUDENTS DO: Turn to a **Shoulder Partner** and share a definition for polygon. Give a **Thumbs Up** when ready.

TEACHER DO: Call on a few students to define polygon. Reiterate as needed that a polygon is a two-dimensional shape with straight sides.

TEACHER SAY: **On the board there are attributes of Mystery Polygons. Turn to your Shoulder Partner and use the clues to identify each polygon. Give me a Thumbs Up when finished.**



STUDENTS DO: Read each set of clues and talk to partner to determine the Mystery Polygon. Give a **Thumbs Up** when finished.

TEACHER DO: Use **Calling Sticks** or another method to randomly select students to share answers. Ask students to share ideas. Ask questions such as:

- Is there more than one shape that fits the clues?
- Explain to me why you decided _________ for this set of clues.

TEACHER SAY: **Nice work. All of the possible answers are quadrilaterals. Raise your hand if you can define a quadrilateral.**

STUDENTS DO: Raise hand to volunteer. Selected students define quadrilateral.

TEACHER DO: If necessary, correct students' misconceptions or errors.

TEACHER SAY: **Today we will measure polygons and talk about a new mathematical concept.**



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Hold up a centimeter ruler.

TEACHER SAY: **I am holding up a tool we use in class for math and other subjects. Turn to your Shoulder Partner and discuss what you know about this tool. For example, how is it divided into smaller pieces? What types of measuring could you do using this tool? What types of measuring can you NOT use this tool for? Give me a Thumbs Up when ready to share.**

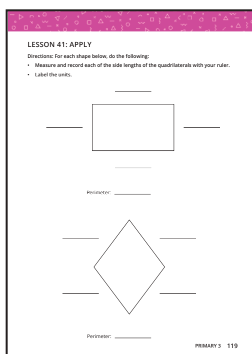
STUDENTS DO: Talk with partner for 1 to 2 minutes about what they know about the centimeter ruler, as well as how they could and could not use it to measure. Give a Thumbs Up to share. Selected students share thinking.

TEACHER DO: Guide the discussion with questions or state these points yourself to ensure that students recall:

- The ruler is broken up into centimeters that are about as big as the width of a child's pinkie finger.
- Centimeters are divided up into 10 millimeters. Millimeters are a lot smaller than centimeters.
- We use a ruler to measure how long or how tall objects are, such as the distance between the bottoms of our feet to the top of our head or from one end of an object to the other end.
- We do not use a ruler to measure how much something weighs, how much mass an object has, or how much it can hold. Mathematicians need to use the right tool for the job, and for linear measurement, rulers, tape measures, and meter sticks are the right tools.

TEACHER SAY: **Good job. When we measure length, width, height, or the distance between two points we can use a ruler, meter stick, or a measuring tape. We are making LINEAR MEASUREMENTS. Linear measurements are measurements from one end of something to the other end. Mathematicians need to use the right tool for the job. Let's add, "Mathematicians use correct tools," to our Thinking Like a Mathematician chart.**

TEACHER DO: Write on Thinking Like a Mathematician chart, "Mathematicians use correct tools."


LESSON 41: APPLY

Directions: For each shape below, do the following:
- Measure and record each of the side lengths of the quadrilaterals with your ruler.
- Label the units.

Perimeter: ______

Perimeter: ______

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TEACHER SAY: **Let's practice linear measurement. Take out your Mathematics Student Book and turn to page Lesson 41: Apply.**

STUDENTS DO: Take out student book and turn to page Lesson 41: Apply.

TEACHER SAY: **In your book are four quadrilaterals. Your job is to measure the sides of each quadrilateral and record your measurements. Since we are measuring in centimeters, we will label our answers. We can use cm as an abbreviation for centimeters. Why is it important for us to label our measurements? Share your thinking with your Shoulder Partner. Raise your hand when you are ready to share with the class.**

STUDENTS DO: Talk to partner about the importance of labeling measurements with the units used to measure. Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If necessary, explain that labels reduce confusion and tell others the unit we used to measure. Additionally, review how to use a ruler to measure, lining the 0 end of the ruler with one end of the side of the polygon and reading the number on the other end.

TEACHER SAY: **Let's get started. You will share a ruler with your Shoulder Partner, but take turns measuring and make sure both of you record your answers in your book. We will come back together after 5 to 10 minutes to discuss the next steps.**

TEACHER DO: Distribute one ruler to each pair of students.



STUDENTS DO: Work with **Shoulder Partner** to measure all sides of the four quadrilaterals, recording the length of each side in centimeters.

TEACHER DO: Walk around and observe students as they measure, noting students who might have difficulty accurately measuring and/or recording. When most students have finished the last shape, use an **Attention Getting Signal** and draw students' attention to the large version you drew of the rectangle from the Apply page.

TEACHER SAY: **Let's stop for a bit. I have drawn a large copy of the Apply page on the board. The shapes I drew are a lot larger than the ones in your book, but I wanted to make sure we could see the shapes and the side measurements. Let's talk about the first shape, the rectangle. Raise your hand to share your rectangle measurements. I will record them on the board so we can check our accuracy together. We will do that for each shape.**

TEACHER DO: Call on students to share measurements. If possible, have students record measurements on the board. If a variety of measurements exist, model measuring together and have students correct their work in the student book.



STUDENTS DO: Selected students share measurements and record them on the board if asked. All students make corrections in the books, if necessary.

TEACHER SAY: **I want to cut a piece of string and use it to trace the lines all around this rectangle. How can I use the measurements we just made to make sure that the string is the same length as all the sides? Share your thinking with your Shoulder Partner. Give me a Thumbs Up when you are ready to share your thinking.**



STUDENTS DO: Discuss for about 1 minute how to determine the length of the string. Selected students share their ideas.

TEACHER DO: If no students suggest it, explain that they can add the lengths of the four sides together to get the total length around the shape and then cut a piece of string that long.

TEACHER SAY: **Let me try with your help.**

TEACHER DO: Choose a student to come up with the student book.



STUDENTS DO: Selected student calculates the sum of all of the sides of the rectangle on the Apply page and then measures and cuts a piece of string that length.

TEACHER SAY: **Now we have one long piece of string. We can lay the string around the rectangle and it should fit exactly.**

TEACHER DO: Hold the student volunteer's book up while they outline the rectangle with the string. If helpful, have the student use tape to hold the string in place.



STUDENTS DO: Selected student lays the string on the rectangle.

TEACHER SAY: **Great job, _____ (student's name). The string is the length of all four sides together. Mathematicians have a word for the length of all the sides of a polygon added together. It is called the PERIMETER. Say, "Perimeter."**



STUDENTS DO: Say "perimeter" aloud.

TEACHER SAY: **When we find the perimeter, we are finding the distance around the whole shape. The PERIMETER of this rectangle is 22 centimeters. We added up all the lengths to have one linear measurement of the distance all the way around the shape. Our piece of string shows us the length of the perimeter.**

TEACHER DO: Hold up the string, which should be 22 centimeters long.

TEACHER SAY: **Your challenge now is to choose two shapes other than the rectangle and cut a piece of string that represents the perimeter. Remember that the perimeter of a shape is the sum of all the side lengths. Keep both strings at your desks. We will compare the perimeters at the end of class. What questions do you have?**

TEACHER DO: Distribute sets of string and scissors to each pair of students. Encourage students to finish measuring the side lengths of shapes if they did not finish the first part of the activity.



STUDENTS DO: Ask clarifying questions if needed. Spend the remainder of the Learn segment finishing measuring, finding the perimeter of two shapes, and cutting string equal in length to the perimeter of each shape.

TEACHER DO: Walk around and observe students as they work. With about 5 minutes left in Learn, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: **Look at your strings. Which shapes had a greater perimeter? Which shapes had a smaller perimeter? Could you have predicted which shapes would have the greater perimeters without measuring? How?**

TEACHER DO: Give students a minute to observe their strings and think. Then call on students to share ideas.



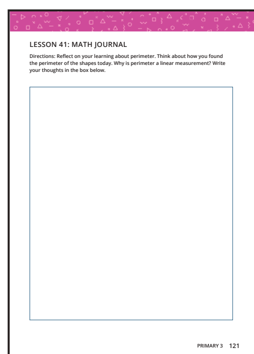
STUDENTS DO: Selected students share thinking about predicting and measuring perimeter.

TEACHER SAY: **Today we learned a great new math word—PERIMETER—and practiced measuring in centimeters. Keep out your student books for Reflect.**



Reflect (5 to 10 minutes)

Directions



LESSON 41: MATH JOURNAL

Directions: Reflect on your learning about perimeter. Think about how you found the perimeter of the shapes today. Why is perimeter a linear measurement? Write your thoughts in the box below.

PRIMARY 3 121

1. **TEACHER SAY:** **Turn in your student book to page Lesson 41: Math Journal. Think about how you found the perimeter of these polygons and about linear measurements. Remember, a linear measurement is the distance between two points. Why is perimeter considered a linear measurement like height or length or width?**



STUDENTS DO: Turn to page Lesson 41: Math Journal and respond to the prompt.

TEACHER DO: Collect students' books and review their journal entries to gather formative assessment data about students' initial understanding of perimeter and linear measurement.

Lesson 42 Overview

LESSON OVERVIEW

This lesson begins with a quick shape sort to review shapes that are polygons versus shapes that are not polygons. During Learn, students cut out different polygons, measure the side lengths, and find the perimeter of the shapes. In Reflect, they consider why perimeter is a measurement for polygons.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, draw on the board or on chart paper the shapes that appear on page Lesson 42: Connect in the Mathematics Student Book.

LEARNING OBJECTIVES

Students will:
- Distinguish between polygons and non-polygons.
- Calculate the perimeter of polygons in centimeters.
- Describe practical applications for measuring perimeter.

KEY VOCABULARY

- Closed figure
- Open figure
- Polygon

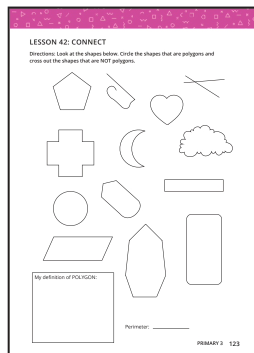
MATERIALS

- Glue (one for each pair of students)
- Scissors (one for each pair of students)
- Centimeter rulers (one for each pair of students)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. **TEACHER DO:** Display the large version of Lesson 42: Connect on the board or on chart paper.

TEACHER SAY: Today we are going to do a quick sorting activity. Please take out your Mathematics Student Book and turn to page Lesson 42: Connect and look at the shapes on the page.



STUDENTS DO: Turn to page Lesson 42: Connect in the student book and look at the shapes.

TEACHER SAY: On this page, you see shapes like the ones on the board. Some of them are polygons and some are not. Take a minute and circle all the shapes that are polygons. Cross out the shapes that are not polygons. Then see if you can write your own definition of a polygon at the bottom. When finished, compare your work with your Shoulder Partner and then we will discuss as a group. You will have 2 to 3 minutes.



STUDENTS DO: Circle polygons and cross out non-polygons. Write definition of polygon. Share work with a partner. Selected students share answers with the group, explain thinking, and show work on the board.

TEACHER DO: If confusion exists, discuss and clarify.

TEACHER SAY: Nice work. Make sure your definition of a polygon states that it is closed figure formed by at least three straight lines, and its sides do not cross. Keep out your student book for Learn.



Learn (35 to 45 minutes)

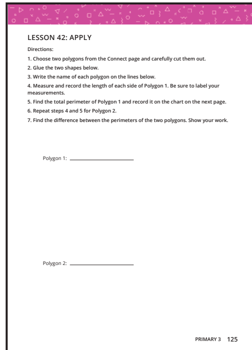
Directions

1. **TEACHER SAY: In our last class, we learned a new math vocabulary word—perimeter. Turn to your Shoulder Partner and discuss what perimeter means. Give me a Thumbs Up if you want to define what perimeter means for the class.**



STUDENTS DO: Share thinking with a **Shoulder Partner**. Selected students share their definitions and provide examples when asked.

TEACHER DO: If necessary, remind students that perimeter is the total length of the outline of a shape.



LESSON 42: APPLY

Directions:

1. Choose two polygons from the Connect page and carefully cut them out.
2. Glue the two shapes below.
3. Write the name of each polygon on the lines below.
4. Measure and record the length of each side of Polygon 1. Be sure to label your measurements.
5. Find the total perimeter of Polygon 1 and record it on the chart on the next page.
6. Repeat steps 4 and 5 for Polygon 2.
7. Find the difference between the perimeters of the two polygons. Show your work.

Polygon 1: ____________

Polygon 2: ____________

PRIMARY 3 125

TEACHER SAY: In our last class, we measured the lengths of all the sides of quadrilaterals and then cut string to represent the perimeter—the sum of all the sides. Today you will work on your own to find the perimeter of two polygons. When you are finished, you and your Shoulder Partner can check each other's work. Turn to page Lesson 42: Apply in your book.



STUDENTS DO: Turn to page Lesson 42: Apply in the book.

TEACHER DO: Read the directions aloud to students, stopping at each step to make sure students understand. Answer any questions students have. Distribute the rulers, scissors, and glue and direct students to share them with a **Shoulder Partner**.



STUDENTS DO: Spend the Learn segment completing the polygon perimeter activity in the student book. When finished, swap books with a **Shoulder Partner** and check each other's work. Clean up materials when directed for Reflect.

TEACHER DO: Walk around the classroom to observe students as they work. Offer assistance where needed. Take note of students who need additional instruction and support with measuring and/or calculating perimeter.

TEACHER SAY: It was a pleasure watching you use math tools to measure and calculate perimeter. Clean up all supplies and put away your student book.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: For the last two math lessons, we explored perimeter. We discussed how perimeter is a linear measurement. Linear measurements tell the distance between two points. Today I would like you to reflect on two questions: When might we need to find the perimeter of a larger object or area? And when would a perimeter measurement be useful? Think quietly for a minute and then share your thinking with your Shoulder Partner. After 2 to 3 minutes, I will call on some of you to share your thinking with the class.**



STUDENTS DO: Think quietly about the questions. When ready, share a thinking with a **Shoulder Partner**. Selected students share thinking with the whole group.

TEACHER DO: Acknowledge credible and creative responses. Take note of students who do not seem to understand perimeter.

TEACHER SAY: Good work today. Give yourself a pat on the back.



STUDENTS DO: Give themselves a pat on the back.

Lesson 43 Overview

LESSON OVERVIEW

In this lesson, students learn a new game called Number Battle. This game can be played throughout the year to review multiplication. In Learn, students estimate, calculate, and compare the perimeters of different polygons. Estimation is a higher-order thinking skill that enables students to determine the reasonableness of their answers and is an important real-life skill.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, draw a parallelogram and a pentagon on the board. See Chapter Preparation for Lesson 43 for detailed instructions.
- Prepare sets of numbers cards 0 to 12 (one set per student).

LEARNING OBJECTIVES

Students will:
- Estimate the perimeters of polygons in centimeters.
- Measure the lengths of sides of polygons in centimeters.
- Calculate the perimeter of polygons in centimeters.
- Explain how to calculate perimeter of polygons.

KEY VOCABULARY

- Actual
- Estimation

MATERIALS

- Number cards 0 to 12 (one set per student)
- Centimeter rulers (one for each pair of students)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

Note to the Teacher: If students struggle with their multiplication facts, have them use the cards 0 to 6. More confident students can use 0 to 12.

1. TEACHER DO: Hand out sets of number cards to each student.

TEACHER SAY: **Let's start math today with a quick multiplication fact practice. This game is called Number Battle and is played with a partner. Each of you will have a deck of number cards. Place their number side down in front of you. Turn over the top two cards and multiply them to find the product. Whoever has the greater product takes all four cards. Be sure to check each other's work. Continue until one player has no cards. Then reshuffle and play again until time is up.**



STUDENTS DO: Play Number Battle with a **Shoulder Partner** for 5 minutes.

TEACHER DO: Give students 5 to 7 minutes to play Number Battle and then bring the group back together.

TEACHER SAY: **I will use Calling Sticks to hear from some of you. If I call on you, please share one multiplication fact that you knew right away and one that was more challenging to solve. Tell me what strategy you will use to learn and remember the challenging fact.**



STUDENTS DO: If called on, share one fact they knew right away and one challenging fact. Explain a strategy they will use to remember challenging multiplication facts.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: In our previous math classes, we explored the perimeter of polygons. Today we will do that again, but we will also practice estimating. You learned about estimation in Primary 2. Raise your hand to remind us what estimation means.**



STUDENTS DO: Raise hand to volunteer. Selected student explains estimation and provides examples.

TEACHER SAY: Estimation means to think about what the actual answer might be without doing the calculation. Why is it helpful for us to be able to estimate? Raise your hand if you have an idea and can share an example.



STUDENTS DO: Raise hand to volunteer. Selected student explains why it is important to be able to estimate and shares an example.

TEACHER DO: If students are not able to explain why estimation is important, share the following points (along with any other examples you find relevant and interesting to students):

- Estimation helps us confirm whether or not our final answer is correct. For example, if I am adding 47 and 21, I can estimate the sum by thinking of 47 as 50 and 21 as 20. 50 plus 20 is 70, so I know the actual sum should be around 70. If I get 80, I know I did something wrong.
- Estimation helps us predict and plan without having to do the actual calculations.

TEACHER SAY: On the board, I have drawn a parallelogram and a pentagon. Take a moment to look at both. Consider which shape might have a greater perimeter and estimate what the perimeters of each shape might be. Talk to your Shoulder Partner and discuss. When you think you have some ideas, give me a Thumbs Up.



STUDENTS DO: Estimate the perimeters of the parallelogram and pentagon on the board. Share thinking with a partner. Give a **Thumbs Up** to volunteer. Selected students share their estimates and how they came up with them.

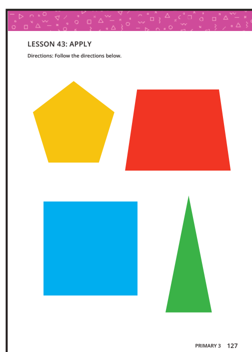
TEACHER DO: Record students' thinking on the board. Ask each student to explain how they came up with their estimate. For example, did they reference something they know the measurement of, did they imagine a centimeter ruler, did they guess, and so on. Ask students to explain why they think the pentagon or parallelogram has a greater/smaller perimeter. Answers may include that the pentagon has more sides, or the parallelogram has longer sides. Accept all answers that students can defend and are reasonable.

TEACHER SAY: Finding an estimate helps us gauge what our answer might be and helps us determine whether or not our final answer is reasonable. Now that we have some estimates and opinions about which will have the greater perimeter, let's find out. Would someone like to come up and help me find the exact perimeter?



STUDENTS DO: Raise hand to volunteer. Selected students measure each side length and then find the total perimeter for each shape. Students may work independently or together.

TEACHER SAY: Good work. We made an estimate based on what we know from previous classes and measuring. Now we can see which polygon actually has the greater perimeter. Lean and Whisper the difference between the two polygons.





STUDENTS DO: Lean and Whisper the difference.

TEACHER SAY: The difference is 6 centimeters. Now it is your turn to estimate and measure the perimeters of polygons. You will work you're your Shoulder Partner. Please take out your Mathematics Student Book and turn to page Lesson 43: Apply. Take a moment to read the directions.



STUDENTS DO: Turn to page Lesson 43: Apply in the book. Read the directions silently.

TEACHER DO: Read the directions aloud to students. Make sure they understand each step.


STUDENTS DO: Work with a **Shoulder Partner** to complete the measurement activity in the student book.

TEACHER DO: Walk around the room observing students as they work. Take note of students who are still having trouble measuring using a centimeter ruler and/or calculating perimeter. Stop and ask some students to explain the reasoning behind their estimates and, as they find the actual perimeters, ask them to discuss what surprised them. When Learn is over, use an **Attention Getting Signal** to bring the group back together.

TEACHER SAY: Nice work estimating, measuring, and ordering. Give me a Thumbs Up if your estimated perimeters and your actual perimeters were different.


STUDENTS DO: Give a **Thumbs Up** if their estimated and actual perimeters were different.

TEACHER SAY: Remember, that is fine. Thinking like a mathematician means really thinking about a problem and using what you know, using the right tool, and checking for accuracy when you are finished. All of you are hard-working mathematicians.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today you found the perimeter of a variety of polygons. Turn and Talk to your Shoulder Partner about how you would explain to someone else how to find the perimeter of any polygon. After 1 or 2 minutes, I will use Calling Sticks to call on some of you to share your thinking.**


STUDENTS DO: Talk to partner about how to find perimeter. Selected students share thinking with the class.

TEACHER SAY: Well done today. Give your Shoulder Partner a high five.


STUDENTS DO: Give **Shoulder Partner** a high five.

Lesson 44 Overview

LESSON OVERVIEW

This lesson begins with an error analysis problem about perimeter. Error analysis is an important computational thinking skill. It is important for students to learn that everyone makes mistakes and that mistakes teach us a lot. Finding errors can be difficult but can result in deep learning of mathematical concepts and skills.

In Learn, students extend their understanding of perimeter with a real-life application. This lesson builds on Chapter 2, where students explored area with only part of the visual image available. Students may notice that they can find area by multiplying the dimensions (an abstract understanding). Other students may need the scaffold of either seeing the grids or drawing in the grids to find the area (more concrete understanding). Whenever students share solutions or thinking, allow for multiple strategies to be presented. Hearing and seeing a variety of strategies benefits everyone and builds flexible thinking. With continued exposure and scaffolded practice, students can move from concrete to an abstract understanding of calculating area.

LESSON PREPARATION FOR THE TEACHER

Prior to the lesson, draw a 4 × 6 array on the board. See Chapter Preparation for Lesson 44 for additional details.

LEARNING OBJECTIVES

Students will:

- Explain the difference between perimeter and area.
- Calculate the perimeter and area of given arrays with some units missing.

KEY VOCABULARY

- Area
- Array
- Perimeter
- Square units

MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: Imagine the array on the board is a pen for horses on a farm. It is 4 meters wide and 6 meters long. I need to put a fence around the pen. I need to determine the perimeter so I know how much fencing to purchase. A friend offered to help me and told me that I would need 24 meters of fencing to go all the way around the pen. Do you agree with my friend or not? Give me a Thumbs Up if you agree. Give me a Thumbs Down if you disagree.

 **STUDENTS DO:** Give a **Thumbs Up** or **Thumbs Down** to respond.

2. TEACHER SAY: Turn to your Shoulder Partner and explain why you agree or disagree with my friend that the perimeter of this rectangular pen is 24 meters. Raise your hand to share with the group.

 **STUDENTS DO:** Share thinking with a **Shoulder Partner**. Raise hand to volunteer. Selected students share thinking and reasoning with the class and answer any questions the teacher asks.

TEACHER DO: Allow students who agree and disagree to share and explain thinking. Ask the following questions:

- Can you show where the fencing would go on this pen? (Students can come up and point.)
- How can we determine how many meters of fencing go on each side of the pen? (Use the grid to see that there are 6 meters on one side and 4 meters on the other.)
- Why do you think my friend thought 24 meters of fencing are needed? (The friend was thinking of area rather than perimeter.)



Learn (35 to 45 minutes)

Directions

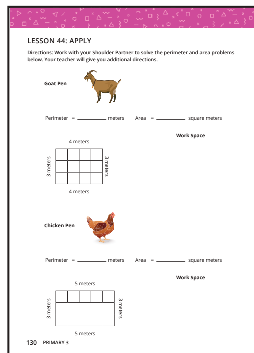
1. TEACHER SAY: Let's look more closely at this pen. The perimeter is the outline of the pen. It is the fence that goes around the pen, not the ground inside the pen. In our last class, you found the perimeters of polygons by measuring and adding up the side lengths of the polygons. But we think my friend was probably thinking about area instead of perimeter when he gave me the answer 24 meters. Raise your hand if can remind us what area means and how we calculate it.



STUDENTS DO: Raise hand to volunteer. Selected students share their definition of area and explain how to calculate it.

TEACHER SAY: The area of a shape is the inside space. It is made up of square units. The area of the horse pen is 24 square meters.

TEACHER DO: If necessary, spend a few minutes making sure students understand the difference between area and perimeter.



LESSON 44: APPLY

Directions: Work with your Shoulder Partner to solve the perimeter and area problems below. Your teacher will give you additional directions.

Goat Pen

Perimeter = ________ meters Area = ________ square meters

Work Space

4 meters / 3 meters / 3 meters / 4 meters

Chicken Pen

Perimeter = ________ meters Area = ________ square meters

Work Space

5 meters / 3 meters / 3 meters / 5 meters

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TEACHER SAY: Today we are going to look at both of these measurements—area and perimeter. To do that we are going to look at some more pens, or enclosures, on a farm. Please take out your Mathematics Student Book and open to page Lesson 44: Apply. Take a quick look at the page while you are waiting for your friends to turn to the correct page.



STUDENTS DO: Take out student book and preview page Lesson 44: Apply.

TEACHER DO: Draw on the board or on chart paper large versions of the 4 × 3 and 5 × 3 arrays shown on page Lesson 44: Apply in the student book.

TEACHER SAY: I have drawn two pens on the board that look just like the ones in your student book. The first pen is for goats and the second pen is for chickens. We have two jobs: Our first job is to determine the amount of fencing we will need to purchase for each pen. Our second job is to determine how much space the goats and the chickens will have to roam. Work with your Shoulder Partner to determine the perimeter and area of the goat pen. Record your answers in your book. Give me a Thumbs Up when you are finished.



STUDENTS DO: Work with partner to find the perimeter and the area of the goat pen. Give a **Thumbs Up** when finished. Selected students share answers and problem-solving strategies.

TEACHER DO: Record and model as students share so others can see their strategies. If possible, select students who used different strategies to solve the problems. Presenting multiple strategies benefits every learner.

TEACHER SAY: The goats will have 12 square meters of space to roam and we need 14 meters of fencing to surround the pen. Now let's look at the chicken pen. This illustration does not show all of the square meters inside the pen. Work with your Shoulder Partner to find the perimeter and area of the chicken pen. Think about how you can find the area if some of the squares are not shown. Give me a Thumbs Up to share when you and your partner are ready.



STUDENTS DO: Work with a **Shoulder Partner** to solve the second perimeter and area problem. Give a **Thumbs Up** when finished. Selected students share answers and explain problem-solving strategies.

TEACHER DO: Record and model as students share so others can see their strategies.

TEACHER SAY: Great work. The chickens have 15 square meters to roam and we need to purchase 16 meters of fencing to surround their pen. I enjoyed hearing your different problem-solving strategies. It helps all of us learn when we talk together about how we solve problems. Now it is your turn to work on some more animal pen problems on your own. If you finish early, try the Challenge problems.

TEACHER DO: Go over the directions with students, making sure they understand the learning activity, which is the same as the activity they just completed together.



STUDENTS DO: Work independently to solve the remaining perimeter and area problems. If they finish early, they can work on the Challenge problems.

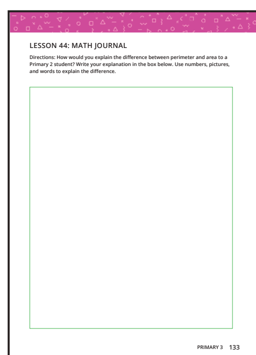
TEACHER DO: Walk around the room observing students as they work. Take note of the strategies they use to solve the problems as well as students who may need extra support at a later time. When Learn is almost over, use an **Attention Getting Signal**.

TEACHER SAY: **Good work today finding both perimeter and area for our animal pens. Keep out your student books for Reflect.**



Reflect (5 to 10 minutes)

Directions



LESSON 44: MATH JOURNAL

Directions: How would you explain the difference between perimeter and area to a Primary 2 student? Write your explanation in the box below. Use numbers, pictures, and words to explain the difference.

PRIMARY 3 133

1. **TEACHER SAY:** **Today we solved problems involving both perimeter and area. If you had to explain the difference between perimeter and area to a Primary 2 student, how would you do that? Write your answer in the box on page Lesson 44: Math Journal. Use numbers, pictures, and words to explain the difference.**



STUDENTS DO: Write a response to the Math Journal prompt.

TEACHER DO: Collect students' books to read their responses. Their entries will provide valuable formative assessment data on their current level of understanding of area and perimeter.

Lesson 45 Overview

LESSON OVERVIEW

In this lesson, students discuss why area is not a linear measurement and then problem-solve to determine the best pen for a given animal based on how much area a given animal requires. Students are challenged to determine the area of the rectangular animal pens with only side dimensions labeled, and they can use any effective strategy they know to determine the area.

LEARNING OBJECTIVES

Students will:

- Explain why area is not a linear measurement.
- Calculate the area of a rectangle given only the length and width.
- Describe the problem-solving strategies they used to solve area problems.

KEY VOCABULARY

- Area
- Dimensions
- Length
- Linear measurement
- Product
- Square units
- Width

LESSON PREPARATION FOR THE TEACHER

- Draw on the board one rectangle with 7 columns and 4 rows and one rectangle with 7 columns and 5 rows. For each rectangle, label the dimensions of one long side and one short side (in meters). Do not draw lines inside the rectangles.

MATERIALS

- Centimeter rulers (for students who do the Challenge problem)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: Why is area not a linear measurement and perimeter is? Think for a minute and then turn and talk to your Shoulder Partner. In a few minutes, we will share with the group.

 **STUDENTS DO:** Talk to a **Shoulder Partner** about the teacher's question.

TEACHER DO: Give 1 to 2 minutes for students to talk about the question and then use **Calling Sticks** to choose students to share thinking. Students should understand the following:

- A linear measurement is the distance between two points.
- Perimeter is a linear measurement because it can be stretched out to one line (as they did with the string in Lesson 41).
- Area is about space, not a line.

Share examples to show perimeter as the measure of distance around an object and that it can be stretched out and to show area being a shaded space inside a polygon.

TEACHER SAY: Area is a measurement of space, not a line around the space. Today we are going to explore just area.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: On the board are two rectangles that represent pens on a farm. The farmer needs to pick a pen for his goats. Goats need to have a pen with an area greater than 30 square meters of space to roam.

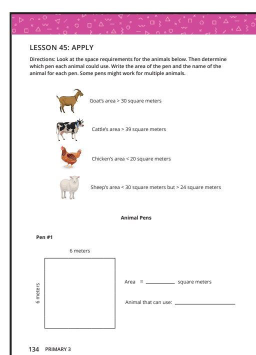
TEACHER DO: Write on the board: goats > 30 square meters.

TEACHER SAY: Neither of these pens shows rows or columns. We see only the dimensions of length and width. Talk to your Shoulder Partner about the area of each of these rectangles and which of these pens could work for the goats. Give me a Thumbs Up when you have an answer and an explanation.



STUDENTS DO: Talk to partner about the area of each pen and which would work for the goats. Give a **Thumbs Up** to volunteer. Selected students share and explain answers.

TEACHER DO: As students share strategies, record them on the board. If no student shares multiplying the two sides of the rectangle, guide students to see that the dimensions are how many rows and how many columns—even though they are not shown—so to find the area, the formula length times width works. At this point, the formula should just be discussed but not recorded as $A = l \times w$ since students may be in different places in their understanding. The formula will be formally introduced in subsequent lessons.



LESSON 45: APPLY

Directions: Look at the space requirements for the animals below. Then determine which pen each animal could use. Write the area of the pen and the name of the animal for each pen. Some pens might work for multiple animals.

Goat's area > 30 square meters

Cattle's area > 39 square meters

Chicken's area < 20 square meters

Sheep's area < 30 square meters but > 24 square meters

Animal Pens

Pen #1

6 meters

6 meters

Area = ________ square meters

Animal that can use: ________________

134 PRIMARY 3

2. TEACHER SAY: The goats need to go in the pen that is 7 meters by 5 meters. We discussed that 7x 5 = 35. The other rectangle has an area of 28 square meters since 7 × 4 = 28. From the problem-solving strategies you shared, we know we should use the dimensions to find the area. We can multiply length times width to find the space inside the rectangle. Take out your Mathematics Student Book and turn to page Lesson 45: Apply. Look at the animals and their pen dimensions on the first page.



STUDENTS DO: Turn to page Lesson 45: Apply in the book. Look at the animals and read the requirements for their pens' dimensions.

TEACHER DO: Select students to read aloud the pen dimensions for each animal. Make sure students understand the meaning of the greater than symbol and its implication for pen size.

TEACHER SAY: Your challenge is to determine the area of each rectangular pen and then which animal—or animals—can use each pen. There may be more than one pen for some of the animals. You will work independently. When you are finished, find another student, compare your answers, and see if you agree on which pen for which animal. If you finish early, try the Challenge problem.



STUDENTS DO: Work independently to find the area of each pen and decide which animal (or animals) will fit in each pen. When finished, compare their work with a partner's and then work on the Challenge problem.

TEACHER DO: Walk around the class observing students as they work. Offer assistance to students who are struggling to calculate area without any grid boxes. Students can draw in the boxes if needed, but should not be encouraged to try that as an initial strategy. When Learn is almost over, use an **Attention Getting Signal**.

TEACHER SAY: Nice work finding the area of these rectangles without any grids shown. I enjoyed seeing the different strategies you are using. You are such great mathematical thinkers. Put away your student books for Reflect.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: Today you worked to find the area of rectangles. Turn to your Shoulder Partner and share one thing that was challenging today about finding the area. Talk about the strategies you used to try to solve the problem. When you are ready, raise your hand.**



STUDENTS DO: Talk to a **Shoulder Partner** about the challenges they faced solving the area problems. Describe the strategies they used. Raise hand when ready. Selected students share challenges and problem-solving strategies with the class.

TEACHER SAY: Great work. Today you explored how to find the area of rectangles when we only have measurements for the length and width. Give your partner a high five.



STUDENTS DO: High-five partner.

Lesson 46 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
This lesson is a culmination of the learning students have done with area so far. They will see the scaffolded learning process of solving area with grids, using given measurements, and by finding the measurements themselves. One intention of this lesson is for students to reflect on where they are in the learning process, what they have mastered, and what they need to continue to work on. This lesson provides a straightforward way for students to further develop metacognitive skills. Metacognition is a student's ability to think about their thinking.	Students will: • Apply a variety of strategies to solve area problems. • Explain the strategies they used to solve area problems.	• Area • Factors • Metacognition • Unit square

LESSON PREPARATION FOR THE TEACHER

- No additional preparation required.

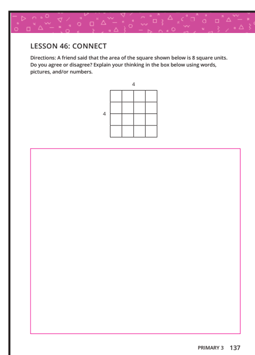
MATERIALS

- Centimeter rulers
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. **TEACHER SAY: Please open your Mathematics Student Book to page Lesson 46: Connect and look at the array on the page.**

STUDENTS DO: Turn to page Lesson 46: Connect and look at the array.

TEACHER SAY: A friend said that the area of this square is 8 square units. Do you agree or disagree? Explain your thinking using words, pictures, and/or numbers.

STUDENTS DO: Work independently to solve the Connect problem. Explain thinking using words, pictures, and/or numbers.

TEACHER DO: Call on several students to share and explain work. Ask questions such as the following:

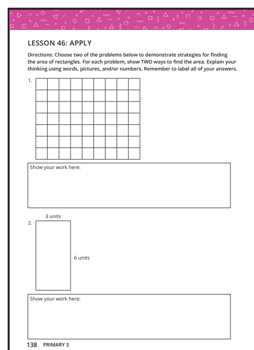
- Where did my friend make an error?
- What is the correct area?
- Did you use repeated addition to solve the problem or multiplication?

STUDENTS DO: Selected students share thinking.



Learn (35 to 45 minutes)

Directions



LESSON 46: APPLY

Directions: Choose two of the problems below to demonstrate strategies for finding the area of rectangles. For each problem, show TWO ways to find the area. Explain your thinking using words, pictures, and/or numbers. Remember to label all of your answers.

1.

Show your work here:

2. 3 units

6 units

Show your work here:

138 PRIMARY 3

1. TEACHER SAY: **Your goal for today is to explain how to calculate the area of rectangles. There are many ways you can do this. Today you will show what you know and reflect on which strategies work well for you and which strategies are more challenging for you right now. Thinking about your thinking, and thinking about what you know, is called metacognition. Metacognition can help you be a better learner. Turn to page Lesson 46: Apply.**



STUDENTS DO: Turn to page Lesson 46: Apply in the book.

TEACHER DO: Read aloud the directions to students. Make sure they understand how to complete the activity. If necessary, have students explain several strategies for finding area, including the use of addition and multiplication.

TEACHER SAY: **Let's try one together so you understand the expectations.**

TEACHER DO: Draw a 7 × 3 array on the board.

TEACHER SAY: **What is one way to find the area of this rectangle? Raise your hand to share.**



STUDENTS DO: Raise hand to volunteer. Selected students share strategies for calculating the area of the rectangle.

TEACHER DO: Select students who use different strategies. If students do not include the following strategies, be sure to model them:

- Add 7 + 7 + 7 or 3 + 3 + 3 + 3 + 3 + 3 + 3.
- Count all of the squares in the array.
- Multiply 7 × 3 or 3 × 7.
- Split the array into two smaller arrays, solve both, and add the sums.

TEACHER SAY: **It is now your job to do the same thing. I will be impressed if you come up with more strategies to find the area of rectangles. What questions do you have?**



STUDENTS DO: Ask questions if needed. Work independently to solve two area problems using two different strategies for each.

TEACHER DO: Walk around the room and observe students as they work. Check to see how students approach the problems. Note the strategies they are using and make sure they are showing their work. Toward the end of Learn, use an **Attention Getting Signal**. Have students answer the two questions on the next page in the student book about the strategies they like and do not like to use. Encourage students to be thoughtful with answers as it will help them develop self-reflection about their learning.

TEACHER SAY: **Thank you for sharing all your thinking and understanding. Keep your student books out for Reflect.**



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: We will use Hands Up, Pair Up to find partners. Then we will do it again so you can form groups of four.**

TEACHER DO: Use **Hands Up, Pair Up** to form groups of four.

TEACHER SAY: In your groups, please share your work and notice if other people used different strategies to solve the problems. Did you get the same answers? See what you can learn from each other.

 **STUDENTS DO:** Share work with peers. Compare the strategies used and final answers.

TEACHER DO: Give students 3 to 5 minutes to see each other's work.

TEACHER SAY: Great job explaining your thinking and learning today. I would love to hear what you learned from this activity. Raise your hand if you would like to share.

 **STUDENTS DO:** Raise their hands to volunteer. Selected students share their learning and observations.

TEACHER DO: Call on several students to share the different ways they solved problems. Record the strategies they used on the board. It is important for students to understand that there are many different ways to solve problems in math and that thinking about what they know—and need to learn—can help them become better learners.

Lesson 47 Overview

LESSON OVERVIEW

In this lesson, students use counters to review division. For this lesson, the equations are written in the Mathematics Student Book, but in the future, you can write equations on the board. The Learn section focuses on understanding that rectangles can have the same area but different perimeters. This exploration entails decomposition—a computational thinking standard. Students investigate this by drawing rectangles with an area of 24 square units and comparing their perimeters.

LEARNING OBJECTIVES

Students will:

- Construct different rectangles with the same area.
- Compare the perimeters of rectangles with the same area but different dimensions.

LESSON PREPARATION FOR THE TEACHER

- Prepare sets of 50 counters (one set per student. See Chapter Preparation for Lesson 47 for details.
- Print out four copies of the Perimeter and Area Squares Blackline Master (32 squares total). Alternatively, draw and cut out 32 squares with sides of at least 8 centimeters.

KEY VOCABULARY

- Area
- Perimeter
- Quotient

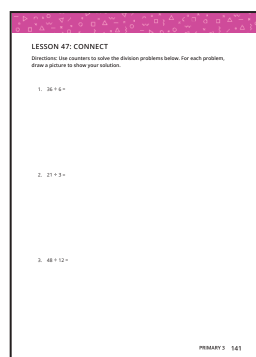
MATERIALS

- Sets of 50 counters (one set per student)
- 32 squares measuring 8 cm × 8 cm
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



LESSON 47: CONNECT

Directions: Use counters to solve the division problems below. For each problem, draw a picture to show your solution.

1. $36 \div 6 =$

2. $21 \div 3 =$

3. $48 \div 12 =$

PRIMARY 3 141

1. TEACHER DO: Hand out sets of counters to students.

TEACHER SAY: Open your Mathematics Student Book to page Lesson 47: Connect. Look at the three problems on the page.



STUDENTS DO: Turn to page Lesson 47: Connect in the student book. Look at the three division problems.

TEACHER SAY: Today for Connect we will use counters to review division. Use your counters to solve the division problems. Then, for each problem, create a drawing to show your solution.



STUDENTS DO: Work independently to solve the division problems and illustrate their solutions.

TEACHER DO: At the end of Connect, go over the answers together. If time allows, have student volunteers share answers, explain how they solved the problems, and draw an illustration to represent their solutions.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Your goal today is to construct shapes with different perimeters but the same area. I have sets of 8 sheets of paper. Each piece of paper represents one square unit. What is one way we can arrange the 8 pieces of paper to make a rectangle? Raise your hand if you would like to come up and show the class.

 **STUDENTS DO:** Raise hands to volunteer. Selected students share thinking by taping the pieces of paper into a rectangle shape on the board.

TEACHER DO: Call on several students to share ideas until you have 4 × 2, 2 × 4, 8 × 1, and 1 × 8 rectangles on the board. Number them 1 through 4 to make it easier to reference them.

TEACHER SAY: What is the area of the first rectangle? Call out your answer.

 **STUDENTS DO:** Call out answer.

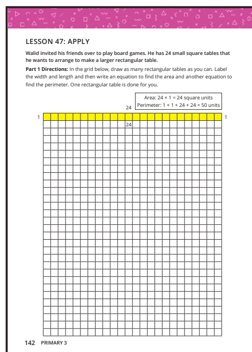
TEACHER SAY: The area of the first rectangle is 8 square units. Raise your hand if you know the area of the other three rectangles.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share and explain answers.

TEACHER DO: Students should recognize that, because each rectangle is made up of 8 squares, the area of each rectangle is 8 square units. If no student volunteers this explanation, be sure to share it with students.

TEACHER SAY: Let's think about perimeter now. If the edge of each piece of paper represents one unit, what is the perimeter of the first rectangle? Turn and Talk to your Shoulder Partner. When you and your partner agree on the perimeter, give me a Thumbs Up.

 **STUDENTS DO:** Discuss the problem with a **Shoulder Partner**. When they agree on the answer, give a **Thumbs Up**. Selected students share answers and explain thinking.



LESSON 47: APPLY

Walid invited his friends over to play board games. He has 24 small square tables that he wants to arrange to make a larger rectangular table.

Part 1 Directions: In the grid below, draw as many rectangular tables as you can. Label the width and length and then write an equation to find the area and another equation to find the perimeter. One rectangular table is done for you.

TEACHER DO: Have students model solutions at the board and record the perimeter of each rectangle. Repeat with the remaining three rectangles.

2. TEACHER SAY: Please open your student book to page Lesson 47: Apply and read the problem and Part 1 directions to yourself.

 **STUDENTS DO:** Turn to page Lesson 47: Apply and read the problem and Part 1 directions silently.

TEACHER SAY: This problem is like the one we did together in Connect with the 8 pieces of paper. Your job is to create tables with an area of 24 square units. Draw the arrays, label them, and then write equations for each table's area and perimeter. One table has been drawn for you. The table is 1 unit wide and 24 units long. It has an area of 24 square units and a perimeter of 50 units. Raise your hand if you have a question about the directions for Part 1.

 **STUDENTS DO:** Ask questions as needed.

TEACHER DO: Go over the directions for Part 2. Make sure students understand before they begin working.

 **STUDENTS DO:** Work independently in student book to solve the perimeter and area story problem.

TEACHER DO: Walk around the class observing students as they work. When students are done, use an **Attention Getting Signal**. Debrief the activity by asking questions such as the following:

- Do all of the rectangles have the same area?
- Do all of the rectangles have the same perimeter?

- How can that be true (same area but different perimeter)?
- Pick a table. How do the perimeter and area of that table compare to each other?


STUDENTS DO: Answer the teacher's questions about the perimeter and area of the tables they drew. Ask friends for help, if needed.

TEACHER SAY: **It is wonderful to see you learn so much about complex mathematical concepts like area and perimeter.**



Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **For Reflect today, you will Turn and Talk to your Shoulder Partner. Compare your tables and share what you notice. Do you see any patterns in what you recorded? Did anything surprise you?**


STUDENTS DO: Talk to partner about the tables they created in the student book. Compare answers, thinking, and strategies.

TEACHER DO: After 2 to 3 minutes, call on several students to share thinking.

TEACHER SAY: **You did great work today. We will continue to explore these concepts in our next math lesson.**

Lesson 48 Overview

LESSON OVERVIEW

In this lesson, students create rectangles with the same perimeter but different areas. This exercise is another application of the computational thinking standard of decomposition. This lesson requires higher-order thinking skills, as students must use several different mathematical skills to approach the problem.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

LEARNING OBJECTIVES

Students will:

- Construct different rectangles with the same perimeter.
- Compare the areas of rectangles with the same perimeters but different dimensions.

KEY VOCABULARY

- Area
- Perimeter

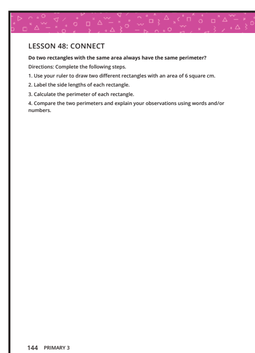
MATERIALS

- Centimeter rulers (one per student)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



LESSON 48: CONNECT

Do two rectangles with the same area always have the same perimeter?

Directions: Complete the following steps.

1. Use your ruler to draw two different rectangles with an area of 6 square cm.
2. Label the side lengths of each rectangle.
3. Calculate the perimeter of each rectangle.
4. Compare the two perimeters and explain your observations using words and/or numbers.

144 PRIMARY 3

1. TEACHER DO: Hand out rulers to students.

TEACHER SAY: Turn in your Mathematics Student Book to page Lesson 48: Connect and read the question at the top of the page silently.



STUDENTS DO: Turn to page Lesson 48: Connect in the book and read the question at the top of the page silently.

TEACHER SAY: In our last math lesson, we looked at rectangles that had the same area. Think about the work you did in that lesson and reflect on the question, "Do two rectangles with the same area always have the same perimeter?" Use your ruler to draw two different rectangles that have an area of 6 square centimeters. Then use words and numbers to compare their perimeters. Give me a Thumbs Up when you are ready to share your thinking.



STUDENTS DO: Work independently to draw two different rectangles, each with an area of 6 square centimeters. Compare the perimeters of the two rectangles and explain thinking in words and numbers. Give a **Thumbs Up** when ready to share. Selected students share observations and explanations with the class.

TEACHER SAY: Do two rectangles with the same area have to have the same perimeter?



STUDENTS DO: Call out responses.

TEACHER SAY: Good work. With your work in our last lesson and today, you proved that two different rectangles with the same area do not have to have the same perimeter.



Learn (35 to 45 minutes)

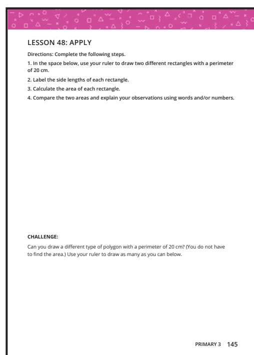
Directions

1. TEACHER SAY: Today we are going to try a new challenge. Can you create at least two rectangles that have the same PERIMETER, but different areas? Think for a moment about what that question is asking. Imagine you must create two different rectangles, each with a perimeter of 20 units. What would need to be true for two different rectangles to have the same perimeter? Think quietly and when you have an answer, share your thinking with your Shoulder Partner. When you and your partner are ready to share your thinking with the class, raise your hands.



STUDENTS DO: Think quietly about the teacher's question. When ready, share thinking with a **Shoulder Partner**. Raise hand to share with the whole group. Selected students explain thinking to the class.

TEACHER DO: If students do not mention the relationship between the length of the sides and perimeter, be sure to explain it: In order for two rectangles to have the same perimeter, the side lengths of both must total the same number when added together.



LESSON 48: APPLY

Directions: Complete the following steps.

1. In the space below, use your ruler to draw two different rectangles with a perimeter of 20 cm.
2. Label the side lengths of each rectangle.
3. Calculate the area of each rectangle.
4. Compare the two areas and explain your observations using words and/or numbers.

CHALLENGE:

Can you draw a different type of polygon with a perimeter of 20 cm? (You do not have to find the area.) Use your ruler to draw as many as you can below.

PRIMARY 3 145

TEACHER SAY: Turn to page Lesson 48: Apply in your student book and read the directions silently.



STUDENTS DO: Turn to page Lesson 48: Apply and read the directions silently.

TEACHER DO: Read the directions aloud to students. Make sure students understand each step in the directions before they begin working.

TEACHER SAY: Work on your own to complete the activity. If you finish early, there is a Challenge problem. The challenge is to see what polygons other than rectangles you can create that have the same perimeter.



STUDENTS DO: Work independently to complete the learning activity in the student books. Students who finish early may try the Challenge problem.

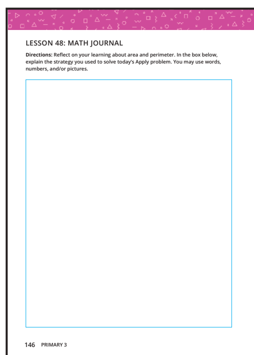
TEACHER DO: Walk around the classroom and observe students as they work. Stop and ask students about the strategies they are using. Take note of students who are struggling with the activity.

TEACHER SAY: You did a great job thinking about how to draw shapes with different areas and the same perimeter. Keep your student books out for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 48: MATH JOURNAL

Directions: Reflect on your learning about area and perimeter. In the box below, explain the strategy you used to solve today's Apply problem. You may use words, numbers, and/or pictures.

146 PRIMARY 3

1. TEACHER SAY: For Reflect, think about what strategy you used today to help you draw shapes with the same perimeter. Explain your strategy in your Mathematics Student Book on page Lesson 48: Math Journal. You may use words, numbers, and/or pictures.



STUDENTS DO: Turn to page Lesson 48: Math Journal in the student book. Explain the strategy they used using words, numbers, and/or pictures.

TEACHER DO: Collect students' books at the end of class and read their answers. This can be a challenging conceptual problem, both to solve and to explain in words. Check to see if students' writing is clear and coherent and whether or not they write about strategies that are accurate and efficient.

Lesson 49 Overview

LESSON OVERVIEW

In today's lesson, students solve story problems involving area and perimeter. They then apply what they have learned about area and perimeter to create their own story problems and solve problems created by other students. Writing solvable story problems requires deep understanding of the concepts as well as accurate strategies for solving problems.

LEARNING OBJECTIVES

Students will:

- Apply strategies to solve real-world area and perimeter problems.
- Apply understanding of area and perimeter to write story problems.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

- Review previous vocabulary as needed.

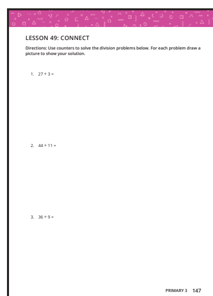
MATERIALS

- Sets of 50 counters (one set per student)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions


LESSON 49: CONNECT

Directions: Use counters to solve the division problems below. For each problem draw a picture to show your solution.

1. $27 \div 3 =$

2. $44 \div 11 =$

3. $36 \div 9 =$

PRIMARY 3 147

1. TEACHER DO: Hand out a set of counters to each student. Have students open their Mathematics Student Book to page Lesson 49: Connect and begin working on the division review activity.



STUDENTS DO: Open student books to page Lesson 49: Connect and work independently to solve the division problems.

TEACHER DO: At the end of Connect, go over the answers together as a class. Choose students to explain problem-solving strategies and illustrate thinking for each problem.



STUDENTS DO: Selected students share answers, explain problems-solving strategies, and illustrate thinking.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Write the following story problem on the board:

Isha is building a fence for her goat pen. The length is 5 meters and the width is 6 meters. How much fencing does she need?

TEACHER SAY: Today our goal is to solve story problems using area and perimeter. Let's look at the problem on the board together. Please raise your hand if you would like to read the problem to the class.



STUDENTS DO: Raise hands to volunteer. Selected student reads the problem aloud.

TEACHER SAY: How would you solve this problem? Turn and Talk to your Shoulder Partner.



STUDENTS DO: Talk to partner about the strategy they would use to solve the problem.

TEACHER DO: Call on students to explain how they would solve the problem. Ask a student to come to the board and create a drawing that represents the problem. Repeat the above, this time writing the following problem on the board:

Ahmed is laying carpet in a room. The room is 6 meters wide and 8 meters long. How many square meters of carpet does he need to buy?

 **STUDENTS DO:** Talk to partner about the strategy they would use to solve the problem. Selected students explain how they would solve the problem and, if asked, create a drawing that illustrates their solution.

TEACHER SAY: How did you determine whether the problem was a perimeter problem or an area problem?

TEACHER DO: Use **Calling Sticks** to select students to share thinking.

 **STUDENTS DO:** Selected students share thinking about how to determine whether a story problem involves perimeter or area. Students may ask for help from a friend, if needed.

TEACHER SAY: Now it is time for you to work on similar story problems. Please turn to page Lesson 49: Apply in your student book and read the directions for Part 1 and Part 2.

 **STUDENTS DO:** Turn to page Lesson 49: Apply in the student book and read the directions silently.

TEACHER DO: Make sure students understand the directions for both parts of the activity. Answer any questions students have.

 **STUDENTS DO:** Ask questions about the directions, if needed. Work independently to solve the perimeter and area problems in the student books.

TEACHER DO: Walk around the classroom and observe students as they work. Take note of the strategies students are using to solve the problems and if they are able to determine whether the problem involves perimeter or area. Identify any misunderstandings that may require reteaching. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: Please keep your books out for Reflect.



Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: You did a great job today solving story problems about area and perimeter. You even acted like a teacher and wrote your own story problems. For today's Reflect, I would like you to trade books with your Shoulder Partner and see if they can solve your problems. Your partner will also check to make sure the problems you wrote makes sense.

 **STUDENTS DO:** Work to solve each other's story problems. Check each other's answers.

TEACHER DO: Give students about 5 minutes to work and check each other's answers. If time allows, ask the following questions:

- Is it easier to solve or write area and perimeter story problems? Why do you think so?
- What do you have to know or be able to do in order to write area and perimeter story problems?

At the end of the class, collect students' books and read the problems they wrote. Being able to create their own story problem is a skill that demonstrates a high level of understanding of the concept of perimeter and area, and some of the students' story problems can be used later as practice during the year to review. Seeing one's own work as an example is powerful.

TEACHER SAY: Writing story problems requires a high level of understanding of area and perimeter. It is a big challenge. Congratulations on trying something challenging.

Lesson 50 Overview

LESSON OVERVIEW

In today's lesson, students shift their focus to multiplication in order to improve fluency with 10s facts, including multiplying by 10 and multiples of 10.

LESSON PREPARATION FOR THE TEACHER

Prior to the lesson, write the following multiplication problems on the board: 3 × 40 = 120; 5 × 60 = 300; 2 × 50 = 100; 80 × 2 = 160.

LEARNING OBJECTIVES

Students will:

- Multiply by 10 and multiples of 10.
- Identify and explain patterns observed when multiplying by 10s.

KEY VOCABULARY

- Multiple
- Pattern
- Strategy

MATERIALS

- Thinking Like a Mathematician chart
- 120 Chart
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. **TEACHER DO:** If it is not already displayed, display the Thinking Like a Mathematician chart and a 120 Chart.

TEACHER SAY: Today we will shift our focus to multiplication and investigating patterns when we multiply by 10 and multiples of 10. Looking for patterns is something good mathematicians do. We will start with multiplying by 10 by playing a fast fact game. I will say a multiplication fact and you call out the answer. Ready?

TEACHER DO: Say a variety of facts with one multiple of 10. Switch the order of multiples. For example: 4 × 10; 10 × 5; 1 x10; and so on.

 **STUDENTS DO:** Call out the answers to each problem.

TEACHER SAY: As we did this quick fact game, what did you notice about multiplying by 10? Turn and Talk to your Shoulder Partner. After a few minutes, I will use Calling Sticks to hear from some of you.

 **STUDENTS DO:** Discuss observed patterns with a **Shoulder Partner**. Selected students share thinking with the class.

TEACHER DO: Use questions or prompts to ensure students understand that when we multiply a digit by 10, the digit stays the same but a zero is added to the Ones place.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: Our next goal today is to multiply by multiples of 10. What are the multiples of 10? Let's count by 10 together to remind ourselves.**

 **STUDENTS DO:** Count 10, 20, 30, 40, and so on.

TEACHER SAY: Great, you are all familiar with how to count by 10s.

TEACHER DO: Direct students' attention to the problems you wrote on the board.

TEACHER SAY: Look at the problems I wrote on the board. Turn to your Shoulder Partner and discuss any patterns you see.



STUDENTS DO: Talk to a **Shoulder Partner** about patterns they see in the problems written on the board.

TEACHER DO: After 2 to 3 minutes, call on students to share thinking with the class. Students might say that they see the smaller problem inside the larger problem. For example: I can see the problem 2 × 5 = 10 in 2 × 50 = 100. There is an extra zero in the Ones place on both sides of the equal sign.

2. **TEACHER SAY: Today you will be learning strategies to solve these types of problems. Let's try a problem together.**

TEACHER DO: Write 2 × 40 on the board.

TEACHER SAY: One strategy is to use a quick drawing of a Base Ten block. Remember that we used them when we worked on place value. A Tens rod is made up of 10 Ones cubes.

TEACHER DO: Draw a Tens rod on the board as shown below.



TEACHER SAY: It takes a long time to draw a Tens rod showing all of the Ones. So when we draw them to help us with multiples of 10, we will just draw one straight line like this.

TEACHER DO: Draw one vertical line on the board as shown below.



TEACHER SAY: We will use one line to represent 10 and draw the smaller problem that is inside the bigger problem. Our problem tells us we need to draw 2 groups of 4 Tens. Think for a moment about what that might look like.

TEACHER DO: Give students 1 minute to think and then draw the following on the board:



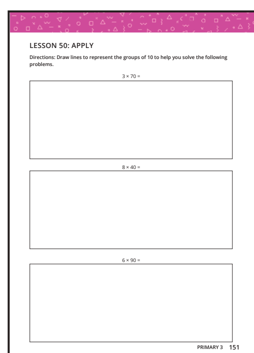
TEACHER SAY: We now have 2 groups of 40 drawn on the board. We can count by 10s to solve the problem. Count with me as I touch each line.

TEACHER DO: Touch each line while counting aloud 10, 20, 30, 40, 50, 60, 70, 80.



STUDENTS DO: Count aloud with teacher.

TEACHER SAY: Now it is your turn to try the strategy of drawing place value pictures to solve problems when using multiples of 10. Please open your Mathematics Student Books to page Lesson 50: Apply and read the directions silently.



LESSON 50: APPLY

Directions: Draw lines to represent the groups of 10 to help you solve the following problems.

3 × 70 =

8 × 40 =

6 × 90 =

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STUDENTS DO: Open student books to page Lesson 50: Apply and read the directions silently.

TEACHER DO: Make sure students understand the directions for the learning activity.

TEACHER SAY: For each question, you will use a drawing to help you solve the problem. If you finish early, you may try the Challenge problem. Please begin.



STUDENTS DO: Work independently to solve the multiplication problems in the student books.

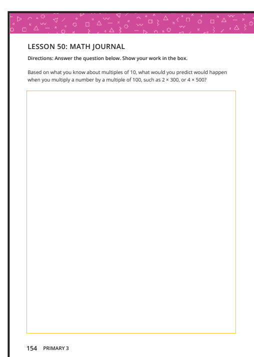
TEACHER DO: Walk around the room and observe students as they work. Check to see if students are able to draw a representation of the problem. If students are struggling to count by 10s, remind them to use the 120 Chart in the room.

TEACHER SAY: Please keep your student book out for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 50: MATH JOURNAL

Directions: Answer the question below. Show your work in the box.

Based on what you know about multiples of 10, what would you predict would happen when you multiply a number by a multiple of 100, such as 2 × 300, or 4 × 500?

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1. **TEACHER SAY: Please turn to page Lesson 50: Math Journal in your student book and read the directions and the question silently.**



STUDENTS DO: Turn to page Lesson 50: Math Journal in the student book and read the directions and question silently.

TEACHER DO: Make sure students understand the directions before they begin working.



STUDENTS DO: Work independently to respond to the prompt on the Math Journal page.

TEACHER DO: After about 3 minutes, select students to share journal responses with the class. Record students' thinking on the board and ask questions to help them understand and explain the pattern for multiplying by 100s. If time allows, ask students if they can think about how to represent this pattern with a drawing. This can be tied back to their work with Base Ten blocks (students can draw a square to represent 100). This is an extended activity to see if they can use mathematical patterns and background knowledge to solve problems. It is a first exposure and not something that needs to be mastered at this time.

TEACHER SAY: Great work today understanding how helpful patterns can be when multiplying by 10 or multiples of 10.

TEACHER DO: Collect students' books and read their entries to assess their current level of understanding of multiplying by 10 and multiples of 10.

PRIMARY 3

Mathematics

THE WORLD AROUND US

TAKING CARE OF OUR WORLD

Chapter 6

Lessons 51 to 60

Chapter 6 : Lessons 51 to 60

Chapter Overview:

In the final chapter of this theme, students explore patterns and relationships to help them build fluency and automaticity with math facts. The chapter begins with multiplication patterns; specifically, multiplying by multiples of 10 and multiplying by 9. Students transfer this specific understanding to a broader explanation of how patterns and relationships can help them develop quick and effective strategies for solving addition, subtraction, and multiplication facts. Students then shift to identifying patterns in the Base Ten place value system. They use this understanding to add and subtract using a variety of strategies. The chapter ends with lessons on volume as students examine the relationship between milliliters and liters and practice reading volume measurements on standard labeled containers.

Identifying patterns, applying different problem-solving strategies, and exploring quantity and meaning through place value helps students understand how many math skills and concepts are interconnected and related to each other. For many students, it can make math less overwhelming once they see how learning one math concept or skill can help them learn others. For these students, mathematics becomes less a series of discrete "things to learn and remember" and more a tapestry of concepts that make complex problems more accessible.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 51 to 60, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.c. Multiply and divide within 100.

1.d. Use strategies to solve multiplication and division problems, including:

1) Manipulatives
2) Drawings
3) Arrays
4) The relationship between multiplication and division

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.a. Read and write numbers to 100,000 using numerals and expanded form.

1.b. Order a set of up to five numbers with values up to 100,000 from least to greatest or greatest to least.

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

2.a. Add and subtract two numbers up to four digits using a variety of strategies, such as:

1) Place value concepts and regrouping.
2) Properties of operations.
3) Relationship between addition and subtraction.

2.b. Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 (for example, 3 × 50, 6 × 30) using strategies based on place value and properties of operations.

D. MEASUREMENT AND DATA:

1.c. Read volume measurements in milliliters and liters from a standard labeled container.

1.d. Estimate volume measurements in milliliters and liters.

1.e. Demonstrate understanding of the relationship between milliliters and liters.

Computational Thinking

Throughout Lessons 51 to 60, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families..

CH 6 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
51	Students will: • Explain patterns observed when multiplying by multiples of 10.
52	Students will: • Investigate and apply patterns and strategies when multiplying by 9. • Teach others one strategy for multiplying by 9.
53	Students will: • Identify patterns in multiplication and addition facts. • Explain how patterns observed in multiplication and addition facts can be helpful when solving problems. • Apply strategies to solve addition and multiplication facts quickly and accurately.
54	Students will: • Identify and describe patterns in the place value system up to the Hundred Thousands place. • Apply strategies for ordering numbers.
55	Students will: • Apply a variety of strategies to solve addition problems. • Explain the importance of learning different problem-solving strategies.
56	Students will: • Estimate the sum of two 3-digit numbers. • Apply a variety of strategies to add two numbers up to four digits.
57	Students will: • Explain the relationship between addition and subtraction. • Apply strategies to subtract two numbers up to four digits. • Use addition to check answers to subtraction problems.
58	Students will: • Apply strategies to solve addition and subtraction story problems. • Reflect on learning to identify areas of strength and opportunities for growth.
59	Students will: • Define volume as the measurement of the capacity of a container. • Explain the relationship between milliliters and liters. • Estimate the size of a milliliter of water. • Identify the best unit to measure the volume of a given container.
60	Students will: • Read volume measurements on a standard labeled container. • Write what they have learned about volume measurement.

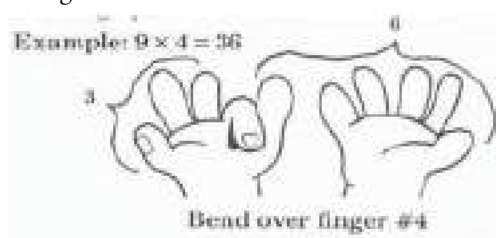
Chapter Preparation for Teacher

Note to the Teacher: In Lesson 60, students will practice reading volume measurements on containers. It may be helpful to start in advance gathering several containers with milliliter and/or liter volume measurements on the labels. For example, soup cans, cooking tools, soda cans or bottles, water bottles or jugs, dish soap or liquid hand soap bottles, shampoo bottles (regular and travel size), large and small milk containers, and so on.

- *You will need enough for each small group of students to have three or four containers.*
- *Consider asking families to contribute clean containers for the learning activity.*

For Lesson 52:

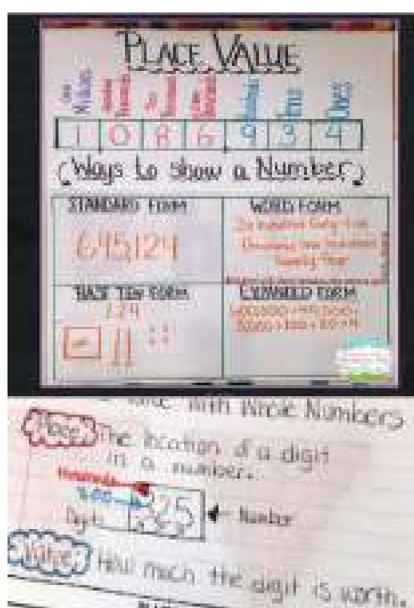
- Prior to teaching this lesson, learn and practice the 9s finger trick (if you do not already know it) and be prepared to teach it to a small group of students.
    - Hold up both hands in front of you. In the example below, we are multiplying 9 by 4.
    - Count to the 4th finger and bend it down as shown below.



    - The fingers to the left of the bent finger represent the Tens, so 3 Tens, or 30, in this example.
    - The fingers to the right of the bent finger represent the Ones, so 6 in this example.
    - Reading the fingers from left to right, the product is 36.
    - *Note: This works only for 9s facts.*
- Prior to the lesson, decide how you will divide students into four groups for the **Jigsaw**. Options can include:
    - Have students count off by 4. Then all the 1s become a group, all the 2s become a group, and so on.
    - Divide the classroom into four equal sections.
    - Predetermine the groups and assign students to each one.
    - Consider the following when making your student groups:
        * You will work directly with the group learning the finger trick.
        * The equations strategy and 120 Chart strategy are relatively straightforward.
        * The Tens strategy is a bit more complex.

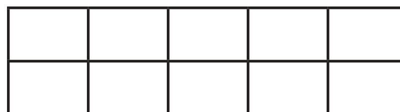
For Lesson 54:

- If available, have a large teaching clock with movable arms and small clocks with movable arms for students (one for each student or pair of students). Otherwise, use the Analog Clock Face—Large Blackline Master to create a teaching clock and the Analog Clock Face—Small Blackline Master to create student clocks.
- Create a large Place Value anchor chart as shown below.



For Lesson 59:

- Have available a large piece of chart paper to record students' thinking about volume.
- Have available scissors (one per student), and glue (one per student).
- Create a large ten frame on chart paper. Each box on the frame should be large enough to hold a small, clear plastic cup.



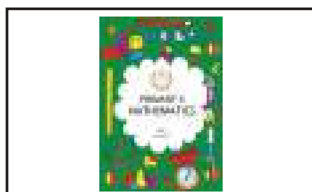
- Gather 10 clear plastic cups.
  - Mark each cup to show 100 milliliters.
  - Measure 100 milliliters of water. Pour the water into each cup and draw a line at the top of the water.
  - The cups should be empty for the lesson.
- Have available one 1-liter container.
  - Fill the container with exactly 1 liter of water.

For Lesson 60:

- Prior to the lesson, gather several containers with milliliter and/or liter volume measurements on the labels. For example, soup cans, cooking tools, soda cans or bottles, water bottles or jugs, dish soap or liquid hand soap bottles, shampoo bottles, milk containers, and so on.
  - You will need enough for each small group of students to have three or four containers.

Materials Used

Student book



Pencil

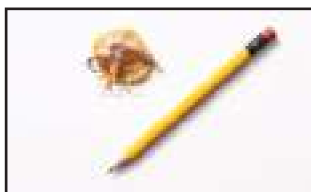


Chart paper



Clear cups



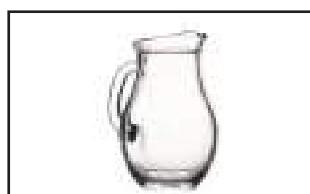
Scissors



Glue



1 Liter container



Teaching clock

Large ten frame on chart paper

Thinking like a mathematician anchor chart

Place value anchor chart

Lesson 51 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students begin with an error analysis to review solving problems with multiples of 10. Analyzing errors is an important computational thinking skill. They should understand that everyone makes mistakes and that mistakes offer wonderful learning opportunities if we take the time to identify where things went wrong. Students also identify patterns when multiplying numbers by multiples of 10 and break apart multiplication problems using parentheses—and the Distributive Property of Multiplication—to make solving these types of problems easier.	Students will: • Explain patterns observed when multiplying by multiples of 10.	• Factor • Multiple • Parentheses

LESSON PREPARATION FOR THE TEACHER

- No new preparation needed.

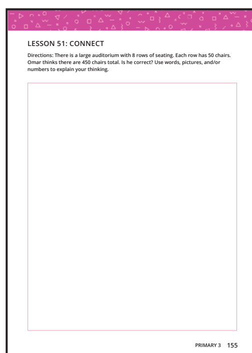
MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. TEACHER SAY: **Please open your Mathematics Student Book to page Lesson 51: Connect. Raise your hand if you would like to read the problem to the class.**



STUDENTS DO: Raise hand to volunteer. Selected student reads the problem aloud.

TEACHER SAY: **You can use any strategy, including the one we used before where we drew a line to represent a Tens rod. Please begin.**



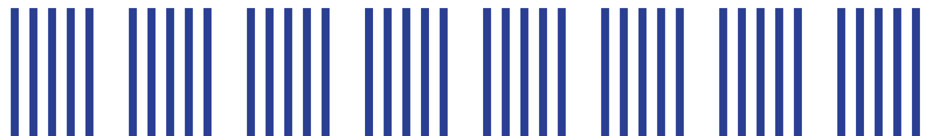
STUDENTS DO: Work independently in student books.

TEACHER DO: Walk around the class and note how students solve the problem. At the end of Connect, call on several students to share solutions.



STUDENTS DO: Selected students share thinking and explanations with the class. Students may ask others for help or support, if needed.

TEACHER DO: Record students' thinking on the board. They may know that 8 × 5 = 40 so 8 × 50 = 400; they may draw lines to represent 10; or they may use another strategy. If they did not remember how to draw a line to represent a Tens rod, review that now by drawing the following on the board:



Explain that it shows 8 groups of 50. Show students how they can count by 10s or combine the groups of 50 to make 100s.

TEACHER SAY: **Nice job checking Omar's work. For mathematicians, identifying errors and correcting them is an important thinking skill. We learn a lot from our mistakes if we are careful and thoughtful and identify where things went wrong.**

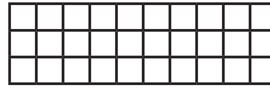


Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Write the following on the board:
6 × 4 = 24
6 × 40 = 240
6 × 400 = 2,400
6 × 4,000 = 24,000

Also draw a 10 × 3 array:



TEACHER SAY: **Today's learning goal is to explain the pattern of multiplying by 10s and multiples of 10. Please look at the equations I wrote on the board. What pattern do you notice? Turn and Talk to your Shoulder Partner about what you see. Raise your hand when you are ready to share your thinking.**



STUDENTS DO: Talk to each other and discuss the patterns they see. Raise hand to volunteer. Selected students share observations with the class.

Note to the Teacher: Students may say something like, "You multiply the first two digits together and then add the same number of zeros."

TEACHER DO: After students have shared, write the following on the board:
5 × 3 = 15
5 × 30 = ______
5 × 300 = 1,500

TEACHER SAY: **Raise your hand if you can solve the problem on the board.**



STUDENTS DO: Raise hand to share a solution. Selected students explain thinking.

TEACHER SAY: **How can you use these patterns—along with multiplication facts—to help you when you are multiplying by 10 or a multiple of 10, such as 30 or 50? Talk to your Shoulder Partner. Give me a Thumbs Up when you are ready.**



STUDENTS DO: Share thinking with a **Shoulder Partner**. Give a **Thumbs Up** when ready. Selected students explains how they could use the patterns they observed to solve multiplication problems.

TEACHER DO: Use examples to help students understand how they can use multiplication facts and the patterns to easily multiply by multiples of 10.

TEACHER SAY: **Please Whisper in your hand how many 10s are in 30.**



STUDENTS DO: **Whisper**: 3.

TEACHER SAY: **This problem is telling me to multiply 5 by 3 10s. Since 3 and 10 are two factors of 30, another way I can write this is 5 × 3 × 10.**

TEACHER DO: Write 5 × 3 × 10 on the board.

TEACHER SAY: **Let's practice this pattern quickly before we talk about 5 × 3 × 10. I will say a number, and when you know its factor pair with 10, raise your hand.**

TEACHER DO: Call out numbers like 50, 20, and 40 and see if students can break them apart into 5 and 10, 2 and 10, and 4 and 10, respectively. If they need additional review, draw arrays or factor trees for each number on the board.



STUDENTS DO: Raise hand to share the factor pairs of each number called out by the teacher.

TEACHER SAY: Let's take a look at the first problem we talked about (5 × 3 × 10). We can actually multiply these numbers in any order. We will leave the 10 by itself for now and multiply the other two numbers first.

TEACHER DO: Draw parentheses around 5 × 3 so the problem now reads (5 × 3) × 10.

TEACHER SAY: These marks are called PARENTHESES. Parentheses are used in math to help us break math problems into smaller parts that may be easier to solve. Parentheses also tell us what part of the problem to solve first. What is 5 × 3? Call out the product.



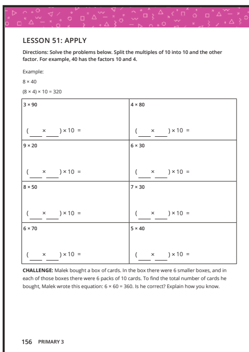
STUDENTS DO: Call out the product.

TEACHER SAY: Now we can take the first product, 15, and apply the pattern we found before. Talk to your Shoulder Partner about what the final product will be when we multiply 15 by 10. How do you know?



STUDENTS DO: Turn and talk to determine the answer is 150. Explain how they know the answer is 150. Selected students share thinking with the class.

TEACHER DO: Review more problems as needed, such as 6 × 20; 7 × 30; and 40 × 5. Each time, break the multiple of 10 into 10 and the other factor and use parentheses. For example: (6 × 2) × 10; (7 × 3) × 10; and (4 × 5) × 10.



LESSON 51: APPLY

Directions: Solve the problems below. Split the multiples of 10 into 10 and the other factor. For example, 40 has the factors 10 and 4.

Example:

8 × 40

(8 × 4) × 10 = 320

3 × 90 (___ × ___) × 10 =	4 × 80 (___ × ___) × 10 =
9 × 20 (___ × ___) × 10 =	6 × 30 (___ × ___) × 10 =
8 × 50 (___ × ___) × 10 =	7 × 30 (___ × ___) × 10 =
6 × 70 (___ × ___) × 10 =	5 × 40 (___ × ___) × 10 =

CHALLENGE: Malek bought a box of cards. In the box there were 6 smaller boxes, and in each of those boxes there were 6 packs of 10 cards. To find the total number of cards he bought, Malek wrote this equation: 6 × 60 = 360. Is he correct? Explain how you know.

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TEACHER SAY: Today you will practice this independently in your student book as you break apart the multiples of 10 into 10 and the other factor. You can also use the strategy of drawing lines to represent Tens rods. Please turn in your student book to page Lesson 51: Apply and begin. If you finish early, try the Challenge problem.



STUDENTS DO: Work independently to practice multiplying by multiples of 10. If finished, work on the Challenge problem.

TEACHER DO: Walk around to observe students as they work. Take note of the strategies they use and whether or not they are able to use mental math strategies to solve the problems. When a few minutes are left, use an **Attention Getting Signal**.

TEACHER SAY: Talk to your Shoulder Partner now to see if you both agree on the answers. Please circle any answers you do not agree on and we will go over them together.



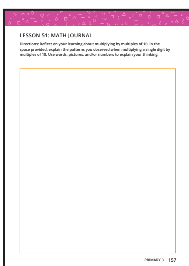
STUDENTS DO: Review answers with **Shoulder Partner**. Discuss with the class if there is disagreement about any answers.

TEACHER DO: If there are any problems to review as a class, do so to ensure all students have the correct answer and a clear understanding of how to use what they know about multiplication facts and multiplying by multiples of 10 to solve problems.



Reflect (5 to 10 minutes)

Directions



LESSON 51: MATH JOURNAL

Directions: Reflect on your learning about multiplying by multiples of 10. In the space provided, explain the patterns you observed when multiplying a single digit by multiples of 10. Use words, pictures, and/or numbers to explain your thinking.

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1. TEACHER SAY: Turn now in your student book to page Lesson 51: Math Journal. Reflect on what you figured out today. In the space provided, explain the pattern you observed when multiplying a single digit by multiples of 10. You can use words, pictures, and/or numbers to explain your thinking.



STUDENTS DO: Respond to the journal prompt in the student book.

TEACHER DO: Allow students a few minutes to respond to prompt. Collect students' books and review journal entries to identify students who need additional instruction and practice. Consider pairing them with students who have a solid understanding of the strategy.

Lesson 52 Overview

LESSON OVERVIEW

In this lesson, students strengthen fluency by solving multiplication or division fact problems (depending on the review activity you select). Then students explore a range of patterns and strategies for multiplying by 9. Students work in smaller groups to form a **Jigsaw**. Each group will become an "expert" on one strategy that they will then teach to the rest of the class. This gives students the opportunity to learn from and teach each other. It can help build students' confidence in their own level of understanding and abilities.

LEARNING OBJECTIVES

Students will:

- Investigate and apply patterns and strategies when multiplying by 9.
- Teach others one strategy for multiplying by 9.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, prepare for the **Jigsaw** activity. See Chapter Preparation for Lesson 52 for detailed instructions and suggestions.

KEY VOCABULARY

- Review vocabulary as needed.

MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Choose from one of the following activities for the Connect time.

- **Mystery Multiplication**—The teacher tells the class one of the factors. Then the students roll a die or selects a number card and multiply the factor by the die roll or number card picked. Example: Factor chosen is 4 and die roll is 5. Student solves 4×5.
- **Roll and Draw**—(Grid paper needed) Students roll one die twice or draw two number cards. Students then draw an array to match the fact, solve the problem, and record the product.
- **Share the Counters**—The teacher writes three division equations on the board. Students use counters to solve the problem, record the equation, and make a drawing to show the quotient.
- **Word Wizards**—The teacher writes two or three story problems on the board and students work together to solve. The problems can be all multiplication, all division, or a combination.



STUDENTS DO: Work on the chosen fact practice for the Connect time (independently or with a partner).



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: **Today we are going to try a new teaching and learning strategy called Jigsaw. You will soon be divided into four groups. Your group will learn and practice one strategy for multiplying by 9. Each group will learn a different strategy. Then your group will be responsible for teaching your strategy to the rest of the class. I will first tell you a little bit about each strategy.**

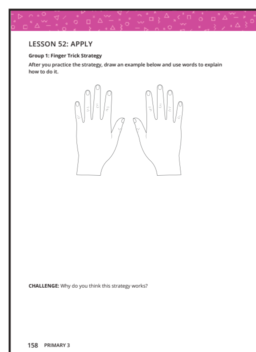
Group 1 will learn how to multiply by 9 using your fingers. Group 2 will investigate patterns by looking at the first 10 products when multiplying by 9. Group 3 will use the 120 Chart to find patterns when we multiply by 9. Group 4 will investigate how we can use our Tens strategy to help us solve problems where we multiply by 9.

Remember that every member of your group must practice and understand your strategy so that you can teach others later. When you move to work with your group, take your Mathematics Student Book with you. What questions do you have before we get into groups?

 **STUDENTS DO:** Ask questions as needed.

TEACHER DO: Divide students into four groups using the method that works best for you.

 **STUDENTS DO:** Get into groups as determined by the teacher.



LESSON 52: APPLY

Group 1: Finger Trick Strategy

After you practice the strategy, draw an example below and use words to explain how to do it.

CHALLENGE: Why do you think this strategy works?

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TEACHER SAY: Turn to page Lesson 52: Apply in your Mathematics Student Book and find your group number. Read the directions with your group and get started learning your group's strategy for multiplying by 9s. Look for patterns that can help you remember your 9s facts. Help each other. If you finish early, try your group's Challenge problem.

 **STUDENTS DO:** Turn to page Lesson 52: Apply and find their group number. Work with a small group on the assigned strategy. Work on Challenge problem if they finish early.

TEACHER DO: Before getting started with Group 1, walk around to each group to make sure they understand what is expected of them. Work with Group 1 students to teach them the finger trick strategy. After approximately 10 to 15 minutes, use an **Attention Getting Signal**.

2. TEACHER SAY: Now we are going to divide into new groups. Each group will have one person from Group 1, one from Group 2, one from Group 3, and one from Group 4.

TEACHER DO: Select one student from each group to form a new group of four. Direct those students to sit together. Repeat until all new groups have been formed. Each new group should have one "expert" for each strategy.

 **STUDENTS DO:** Move to sit with the new group.

TEACHER SAY: Now there is an expert for each strategy at every table. Your next goal is to teach each other the strategies you learned or the patterns you observed when multiplying by 9. What questions do you have?

 **STUDENTS DO:** Ask clarifying questions, if needed.

3. TEACHER SAY: Each of you will have about 5 minutes to teach your new group the strategy you learned. Encourage your "students" to record notes in the student book on your group's page. I will give you a signal when it is time to switch to the next strategy. Start with the Group 1 strategy.

 **STUDENTS DO:** Teach the students in the group how to apply the strategy learned in their original group. Record notes and examples related to the other three strategies learned.

TEACHER DO: Walk around and observe students as they teach each other. Are they able to apply the strategy they learned? What questions do they still have? Take note of students who are very good at teaching others the strategy they know. If time allows, have those students review a strategy for the whole class.

 **STUDENTS DO:** Selected students review multiplication strategies for the whole class.

Note to the Teacher: Ensure that students understand the following for each strategy:

- ***Finger trick:** Make sure students understand how to hold their hands, how to put down the correct finger (the second factor) and how to determine the product (Tens and Ones).*
- ***List of equations:** Students should notice how the Tens increase each time and the Ones decrease each time. If they look down the list of products, they should see they are counting from 0 (though it is not written) to 9 in the Tens place and from 9 to 0 in the Ones place. If they complete the Challenge, they should notice that the sum of the Tens and Ones digit in each product is 9. For example, in 9 × 3 = 27, 2 + 7 equals 9; in 9 × 6 = 54, 5 + 4 equals 9, and so one.*
- ***120 Chart:** Students should notice a diagonal pattern forming and continuing each time they multiply by 9.*

- ***Tens facts:*** *Students should recognize that they can use Tens facts to quickly multiply by 9. For example, in 9 × 5 = ?, they can think of the problem as 10 × 5, or 10 fives (50), then subtract one of the 5s to get 45. Ensure students understand they should not be subtracting the 9 (unless they are multiplying 9 × 9, in which case both factors are 9).*

TEACHER SAY: **You have all done a fabulous job learning strategies for multiplying by 9 and teaching each other. Keep your student book out for Reflect so you can reflect on what you just learned.**



Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **For today's Reflect, you will work with your Shoulder Partner to share what you wrote down for all four strategies, discuss your thinking, and then decide which strategy worked best for you today. Each of you will have about 1 minute to share, so you have 2 minutes total.**



STUDENTS DO: Talk to **Shoulder Partner**, sharing notes and thinking, and deciding which strategy was most effective for them.

TEACHER SAY: **I want to hear what you liked. Stand up if you liked the finger trick strategy the most today.**



STUDENTS DO: Stand to respond.

TEACHER DO: Call on one or two students to share why this was the favorite strategy today. Encourage students to describe mathematical reasons for choosing the strategy (for example, easy to remember and apply, easy to use mentally, and so on) rather than reasons related solely to fun. Repeat this for each of the four strategies.

TEACHER SAY: **We learned and practiced some interesting strategies today. You may find that your favorite changes, or possibly the one that you use the most is different from the one you chose today. Give yourself a high five for being great teachers and learners today.**



STUDENTS DO: Give themselves a high five.

Lesson 53 Overview

LESSON OVERVIEW
During Connect, students apply the strategies for multiplying by 9 learned in the previous math lesson. They will solve as many problems in 2 minutes as they can, check answers, and then reflect on how well they did and what strategy (or strategies) they tried. In Learn, students investigate, identify, and use patterns in multiplication and addition facts. They will solve math fact problems independently and then identify patterns that can help them. Students will get a chance to improve automaticity with math facts.

LEARNING OBJECTIVES
Students will: • Identify patterns in multiplication and addition facts. • Explain how patterns observed in multiplication and addition facts can be helpful when solving problems. • Apply strategies to solve addition and multiplication facts quickly and accurately.

LESSON PREPARATION FOR THE TEACHER
No new preparation needed.

KEY VOCABULARY
• Addition facts • Automaticity • Multiplication facts

MATERIALS
• Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. **TEACHER SAY: For the first 2 minutes of class today, you will solve as many multiplication problems involving 9s facts as you can. Use any of the strategies you learned in our last math lesson. After 2 minutes, we will check answers together. Open your Mathematics Student Book to page Lesson 53: Connect and wait for me to say, "Go." When I say, "Stop," immediately put down your pencil.**



STUDENTS DO: Turn to page Lesson 53: Connect in the book and wait for the teacher to give the signal. Solve as many 9 fact multiplication problems as they can in 2 minutes. Stop at the teacher's signal.

TEACHER DO: After 2 minutes, stop all students. Ensure that everyone puts their pencils down.

TEACHER SAY: Now swap books with your Shoulder Partner so we can check answers. If your partner answered a problem correctly, put a check mark next to it. If they answered it incorrectly, put an × next to it. If they did not answer, do not write anything.



STUDENTS DO: Swap student book with a **Shoulder Partner** and check each other's work as the teacher reads the problems and answers aloud.

TEACHER SAY: Return your partner's book. Count and record how many problems you answered correctly, how many you answered incorrectly, and how many you did not answer. Also, put a check mark next to the strategy you used most today and answer the questions: Do you think that strategy worked well for you? Why or why not? We will try this again another day to see if we can improve.



STUDENTS DO: Record how they did and the strategy they used most.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: What do we mean when we talk about math facts? Raise your hand if you know.**



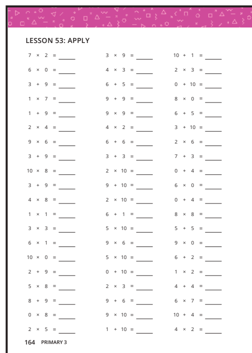
STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If students are not able to answer the question, explain that math facts are the answers we get when we add, subtract, multiply, or divide numbers 0 to 10.

TEACHER SAY: When we remember our math facts, it makes it much easier for us to solve more complicated problems. That is why we practice them often. Practice helps us become both quick and accurate. It is important that we can solve math facts problems with AUTOMATICITY, or without taking time to think about them. This can also help us in life outside school. Think about a time when you had to solve a math problem in real life, but you could not draw a picture or use models to help you. Give me a Thumbs Up if you want to share.



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students describe situations when they had to use math facts to solve a problem quickly in real life.



LESSON 53: APPLY

7 × 2 = ____	3 × 9 = ____	10 + 1 = ____
6 × 0 = ____	4 × 3 = ____	2 × 3 = ____
3 + 9 = ____	6 + 5 = ____	0 + 10 = ____
1 × 7 = ____	9 + 9 = ____	8 × 0 = ____
1 + 9 = ____	9 × 9 = ____	6 + 5 = ____
2 × 4 = ____	4 × 2 = ____	3 + 10 = ____
9 × 6 = ____	6 + 6 = ____	2 × 6 = ____
3 + 9 = ____	3 + 3 = ____	7 + 3 = ____
10 × 8 = ____	2 × 10 = ____	0 + 4 = ____
3 + 9 = ____	9 + 10 = ____	6 × 0 = ____
4 × 8 = ____	2 × 10 = ____	0 + 4 = ____
1 × 1 = ____	6 + 1 = ____	8 × 8 = ____
3 × 3 = ____	5 × 10 = ____	5 + 5 = ____
6 × 1 = ____	9 × 6 = ____	9 × 0 = ____
10 × 0 = ____	5 × 10 = ____	6 + 2 = ____
2 + 9 = ____	0 + 10 = ____	1 × 2 = ____
5 × 8 = ____	2 × 3 = ____	4 + 4 = ____
8 + 9 = ____	9 + 6 = ____	6 × 7 = ____
0 × 8 = ____	9 × 10 = ____	10 + 4 = ____
2 × 5 = ____	1 + 10 = ____	4 × 2 = ____

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2. **TEACHER SAY: Today we are going to identify and use strategies that can help us develop automaticity with math facts. We are going to do work similar to what we did in Connect today in just a moment. You will have 2 minutes to solve as many math fact problems as you can in your student book. However, this time there are addition and multiplication problems. Pay close attention to the symbols as you work. Turn to page Lesson 53: Apply and wait for my signal. When I say, "Stop," put down your pencil.**



STUDENTS DO: Turn to page Lesson 53: Apply. At the teacher's signal, solve as many problems as they can in 2 minutes. Stop at the teacher's signal.

TEACHER DO: After 2 minutes, stop all students. Ensure everyone puts down their pencils.

3. **TEACHER SAY: Please count and record how many problems you completed.**



STUDENTS DO: Count and record how many problems they answered.

TEACHER SAY: We are not going to check our answers yet because we are going to work on this page together for a bit. I am interested to hear what strategies you used today. Please raise your hand to describe one strategy you used to answer these problems quickly and correctly.



STUDENTS DO: Raise hand to volunteer. Selected students describe the strategies they used to solve problems.

TEACHER DO: Use questions to prompt students' thinking and discussion, such as the questions below. After a student answers, follow up by asking, "How can we use that knowledge to help us solve math facts quickly?"

- What is anything multiplied by 0?
- What is anything plus 0?
- What is anything multiplied by 1?
- How are doubles and multiplying by 2 similar?
- What was our strategy for multiplying by 10?
- What strategies did we learn the other day for multiplying by 9?
- How are multiplying by 2 and 4 related?
- How are multiplying by 5 and 10 related?
- How does the Commutative Property of Addition and the Commutative Property of Multiplication help us with automaticity?
- What other relationships or patterns did you see in the math facts?

TEACHER SAY: You used some excellent strategies. Now I would like you to think about the strategies you just heard. Solve all of the math fact problems on this page, but try using a

strategy you heard about. You will have more than 2 minutes. Pay attention to the strategies you use because you will record them on the chart on the next page. For example, when I do problems like this, I like to answer the easiest ones for me first. The easiest ones for me are multiplying or adding by 0, 1, and 10. Multiplying by 4 is harder for me, so I like to think of those problems as doubling when I multiply by 2. For example, if the problem is 7 × 4, I think of it as 7 × 2 twice. You may begin.

 **STUDENTS DO:** Solve all of the problems on the page, noting strategies they use in the chart on the next page.

TEACHER DO: When there are a few minutes left in Learn, use an **Attention Getting Signal**.

TEACHER SAY: **Keep your books open to the strategy chart you created for Reflect.**



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY:** **For today's Reflect, you will work with your Shoulder Partner to share with each other what you wrote down on your strategy chart, discuss the strategies you used, and then decide which one—or ones—worked best for you today.**

 **STUDENTS DO:** Talk to a partner, sharing what strategies they used today. Decide which strategy worked best for them.

TEACHER SAY: **I want to hear what worked well for you today. I will use Calling Sticks** to hear from a few of you.

 **STUDENTS DO:** Selected students share observations.

TEACHER DO: Encourage students to explain how or why a strategy worked for them.

TEACHER SAY: **You tried a lot of strategies today as you developed automaticity with your math facts. Give yourself a hug and keep practicing.**

 **STUDENTS DO:** Give themselves a hug.

Lesson 54 Overview

LESSON OVERVIEW

Today's lesson incorporates review of previously learned concepts around time and place value to the Hundred Thousands place. This review will help prepare students for more challenging work. Working with large numbers can be difficult for young students, so take your time and be sure they are developing a deep understanding. To support this understanding, students find patterns in the place value chart and number values.

A common misconception among students who struggle with place value is that the first digit in a number dictates the value of the whole number. In other words, they may think that 90 is greater than 125 because 90 begins with a 9 and 125 begins with a 1. In today's Learn, students investigate and explain why this misconception is common and what to do instead.

LESSON PREPARATION FOR THE TEACHER

- Have available a large teaching clock and small student clocks with movable arms. If not available, use the Analog Clock Face—Large Blackline Master to create a teaching clock and the Analog Clock Face—Small Blackline Master to create student clocks.
- Create a Place Value anchor chart as described in Chapter Preparation for Lesson 54. This chart will be reviewed with students and then be displayed as a reference for the rest of the school year.

MATERIALS

- Large teaching clock and small student clocks
- Place Value anchor chart
- Mathematics Student Book and pencil

LEARNING OBJECTIVES

Students will:
- Identify and describe patterns in the place value system up to the Hundred Thousands place.
- Apply strategies for ordering numbers.

KEY VOCABULARY

- Compare
- Digit
- Hundred Thousands place
- Hundreds place
- Order
- Place value
- Ten Thousands place
- Thousands place
- Value



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: We look at the clock and tell time every day, but we have not really practiced telling time together for a while. Let's take a few minutes to review now. Tell your Shoulder Partner everything you remember about telling time.

 **STUDENTS DO:** Talk to **Shoulder Partner** about what they know about telling time.

TEACHER SAY: Who would like to share something you or your partner said? Raise your hand.

 **STUDENTS DO:** Raise hand to volunteer. Selected students share thinking.

TEACHER SAY: You remembered a lot. Let's practice telling time now. I will use Calling Sticks. The first name I pick will be for a student to come move the hands on the clock. The second name I pick will be for a student to read the time aloud.

TEACHER DO: Call two students at a time. As students work, be sure the first student puts the hour hand in the correct place based on where the minute hand is (for example, halfway between the

1 and the 2 for 1:30). If appropriate, ask students to read the time another way (for example, 3:15 and quarter after 3).

 **STUDENTS DO:** The first student moves the hands to show a time on the clock. The second student reads the time aloud.

TEACHER SAY: Wonderful work reviewing time today. We will continue to practice each day even when it is not during our math lesson.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Display the Place Value anchor chart where all students can see it. Write the following numbers on the board:

- 1,312
- 23,406
- 451,234

TEACHER SAY: On the board there are three large numbers. Read each number aloud to your Shoulder Partner and then discuss how each number is different. Give me a Thumbs Up when you are ready to share.

 **STUDENTS DO:** Discuss observations about the three numbers with a **Shoulder Partner**. Give a **Thumbs Up** when ready to share. Selected students share observations with the class.

TEACHER DO: Guide students to use place value language when describing each number, such as 1,312 has four digits and goes up to the Thousands place, and 23,406 has five digits but has a digit in the Ten Thousands place so it is greater than 1,312, and so on.

TEACHER SAY: Now let's look at this chart. Give me a Thumbs Up if this information looks familiar. I will call on a few of you to share something you remember about place value and the place value chart.

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected students share what they remember about place value.

TEACHER DO: Be sure students hear (either from peers or from you) the following:

- Numbers have different values.
- Digits are the numbers 0 to 9 that make up larger numbers.
- We determine how large a number is by its value.
- In a number with more than one digit, each digit is in a place and that place has value. We call that place value. (Point to the definitions of place and value on the chart.)

TEACHER SAY: Good thinking. Let's work today to find patterns in the place value chart. If the digit 1 is in the Ones place, what is its value? Whisper the answer to me.

 **STUDENTS DO: Whisper** answer.

TEACHER SAY: Its value is 1. What if the digit 1 is in the Tens place? What is its value? Whisper that answer to me.

 **STUDENTS DO: Whisper** answer.

TEACHER SAY: Its value is 10. How many times greater is the Tens place than the Ones place? Talk to your Shoulder Partner about that question. Raise your hand if you think you know.

 **STUDENTS DO:** Talk to a **Shoulder Partner**. Raise hand to volunteer. Selected students share thinking.

TEACHER SAY: We can write this as an equation also.

TEACHER DO: Write 1 × ______ = 10 on the board.

TEACHER SAY: 1 times what is 10? Show me using your fingers.


STUDENTS DO: Hold up fingers to show answer.

TEACHER DO: Confirm the correct answer and write 10 in the blank.

TEACHER SAY: Is this true as we compare each place and the one next to it? How many times greater is the Hundreds place than the Tens place? How many times greater is the Thousands place than the Hundreds place? Think for a minute and then share your ideas with your Shoulder Partner. I will use Calling Sticks to hear from some of you.


STUDENTS DO: Think about the question and then share ideas with a partner. Selected students discuss thoughts with the class.

TEACHER SAY: Each one of these places is 10 times greater than the one before it. What can we make with 10 Ones? Call out if you know.


STUDENTS DO: Call out answers.

TEACHER SAY: We can make 1 Ten with 10 Ones. What can we make with 10 Tens? Call out if you know.


STUDENTS DO: Call out answers.

TEACHER SAY: We can make 1 Hundred with 10 Tens. What can we make with 10 Hundreds? Call out if you know.


STUDENTS DO: Call out answers.

TEACHER SAY: Let me ask this in a different way. How many Thousands would we need to make 1 Ten Thousand? Call out if you know.


STUDENTS DO: Call out answers.

TEACHER SAY: How many Ten Thousands would we need to make 1 Hundred Thousand? Call out if you know.


STUDENTS DO: Call out answers.

TEACHER SAY: The place value system is based on 10s. Each place is 10 times greater than the one before it. Let's connect this idea now to comparing and ordering numbers. Open your Mathematics Student Book to page Lesson 54: Apply. Who would like to read the problem aloud?

LESSON 54: APPLY

Directions: Solve the problem below with your partner.

Gamila said that since 9 is the digit with the largest value, the number 999 is larger than 1000. Do you agree or disagree? Why?

Directions: Solve the rest of these problems independently.

Puzzle 1:

This number has 5 Thousands, 7 Hundreds, 6 Tens, and 4 Ones. What number is it?

____

Puzzle 2:

This number has 12 Hundreds, 15 Tens, and 6 ones. What number is it?

____

Puzzle 3:

Write the following number in standard form. Pay attention to the place value.

6,000 + 50,000 + 40 + 300 + 2 =

____

Puzzle 4:

Write the following number in expanded form.

3,509 = ______________

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STUDENTS DO: Read aloud the problem if called on.

TEACHER SAY: Work with your Shoulder Partner to solve the problem. Be sure you both agree on the answer. When you are done checking your work on the first one, work independently to solve the rest of the problems in this section.


STUDENTS DO: Work with a **Shoulder Partner** for the first problem and then independently.

TEACHER DO: With about 5 minutes remaining in Learn, go over the answers to the Place Value Puzzles with students. Allow them to change incorrect answers, if necessary.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER DO:** At the end of Learn time, use an **Attention Getting Signal**.

TEACHER SAY: Let's go back to the first question and reflect on what we now know and understand. Stand up if you agree with Gamila.

 **STUDENTS DO:** Stand as appropriate and defend their answer if called on.

TEACHER DO: Ask at least one student standing to defend their answer. Have standing students sit and ask students to stand if they do not agree with Gamila.

 **STUDENTS DO:** Stand as appropriate and defend answer if called on.

TEACHER DO: Ask at least one student standing to defend their answer. Probe with follow-up questions as needed. By the end of Learn, ensure all students understand that Gamila was not correct and that the reason why is that 1,000 goes to the Thousands place, while 999 only goes to the Hundreds place.

Lesson 55 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY

LESSON OVERVIEW

Students begin this lesson by solving a place value error analysis task. In Learn, students review and practice addition using strategies such as place value pictures, number lines, breaking apart the numbers, and/or the standard algorithm. Allow students to use the strategy with which they are most comfortable and successful and to learn from peers about other strategies to try. Math dialogue is where deep understanding happens, so be patient and willing to ask for students to think critically about strategies and solutions.
Lessons 55 to 57 discuss addition and subtraction strategies that engage students in the computational thinking skill of decomposition. Decomposition is a strategy in which a number, problem, or challenging task is broken into smaller pieces to make it easier to solve.

LEARNING OBJECTIVES

Students will:
- Apply a variety of strategies to solve addition problems.
- Explain the importance of learning different problem-solving strategies.

LESSON PREPARATION FOR THE TEACHER

- No new preparation needed.

KEY VOCABULARY

- Addition
- Decompose
- Number line
- Place value
- Regrouping
- Strategy
- Sum

MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Write the following on the board:

1. 15,360 = 1,000 + 5,000 + 300 + 60 + 0
2. 234 + 352
(200 + 3 + 4) + (300 + 50 + 2) = 559

TEACHER SAY: On the board are two problems. In the first one, a student wrote 15,360 in expanded form. Give me a Thumbs Up if you agree with the work shown or a thumbs down if you do not. I will ask a few of you to share your reasoning.



STUDENTS DO: Give a **Thumbs Up** or thumbs down to agree or disagree. Selected students explain reasoning.

TEACHER DO: Select some students who agree to share so they can think through ideas about place value and have the opportunity to self-correct. Select some students who disagree to share reasoning.

TEACHER SAY: In the second problem, a student added these two numbers together. They decided to decompose each number into expanded form to add the Hundreds, then the Tens, and then the Ones. Look at the work and give me a Thumbs Up if you agree with the thinking or a thumbs down if you disagree with the thinking. I will call on a few of you to share your reasoning.



STUDENTS DO: Give a **Thumbs Up** or thumbs down to agree or disagree. Selected students explain reasoning.

TEACHER DO: Repeat the sharing process with the second problem.

TEACHER SAY: I enjoyed hearing your thinking. Everyone makes mistakes and being able to find them and correct them helps us to learn. In fact, we often learn a lot more from getting things wrong than we do from getting things right the first time. Today we are going to review some of our addition strategies.



Learn (35 to 45 minutes)

Directions

1. **TEACHER DO:** Write 742 + 239 and 809 + 135 on the board.

TEACHER SAY: For the next few lessons, we will review and practice addition and subtraction strategies. Remember that the goal is to use a strategy that is efficient for you and arrives at the correct answer. That can be different for different people and different for different problems. Being a flexible mathematician is important and means that you look at a problem and determine the best strategy for that situation. We learn a lot from listening to other mathematicians and their strategies.

TEACHER DO: Direct students' attention to the problems on the board.

TEACHER SAY: I am going to use two different strategies to solve these problems. You may remember the strategies from Primary 2. Watch and listen closely. You might have a different strategy, and I want to hear about it after the demonstration. For the first problem, I am going to use a place value drawing to solve. For the second problem, I am going to use a number line.

TEACHER DO: Demonstrate adding 742 + 239 with a place value strategy. Draw the number 742 in three columns labeled Hundreds, Tens, and Ones as shown below. Use larger squares to represent Hundreds, slender rectangles to represent Tens, and small squares to represent Ones. Directly underneath, draw 239 as shown below. Model how to add each section, starting with the Ones place and regrouping as needed. Record the sum.

Hundreds	Tens	Ones

TEACHER SAY: Talk to your Shoulder Partner about what you observed me do and why you think I did it.



STUDENTS DO: Share thinking with a **Shoulder Partner**.

TEACHER SAY: I will use Calling Sticks to hear from three people. Please share what you noticed if I call on you.



STUDENTS DO: Selected students share an observation.

TEACHER DO: Correct any major misconceptions students have about using this strategy to add or about regrouping.

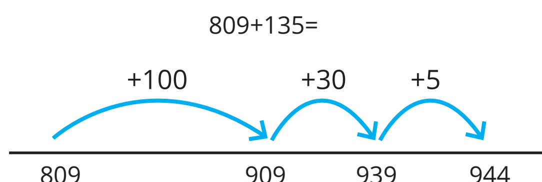
TEACHER SAY: Now I want to add 809 and 135 using a number line. How could I make easy

jumps from 809 to add 135? In other words, how can I break 135 down into smaller parts to make it easier to jump? Please discuss this with your Shoulder Partner.



STUDENTS DO: Discuss with a partner ways to break 135 into easier chunks so they can use a number line to add.

TEACHER DO: Call on a few students to hear suggestions. If no one suggests it, share that an easy way to break up a three-digit number is by Hundreds, Tens, and Ones. Explain that 135 can be broken into 100 + 30 + 5 to make the "hops" along the number line. Demonstrate "hopping" starting at 809 on the left side of an empty number line drawn on the board (as shown below). Draw a half-circle hop from 809 to 909 by adding 1 Hundred. Label the 100 on top of the half-circle hop to keep track of your chunks. Then add 30 to hop to 939. Finally, make a last hop of 5 to make it to 944.



TEACHER SAY: **Now that you have seen two different strategies to add large numbers, who has a different strategy they would like to share? Give me a Thumbs Up.**



STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students model and explain strategies on the board.

TEACHER DO: Record the strategies students are sharing. It might be helpful to create an anchor chart that lists all the various strategies for reference. If no student shares the standard algorithm, model that at the very end. Another strategy that may be shared includes decomposing the numbers into Hundreds, Tens, and Ones without drawing place value images—writing just the numbers 700 + 40 + 2 and 200 + 30 + 9 and then combining the Hundreds, Tens, and Ones to find the sum.

Students were introduced to and practiced the algorithm in Primary 2 but may need refreshing, particularly with regrouping. If modeling the algorithm, remind students to keep the Ones, Tens, and Hundreds aligned and to always start by adding the Ones and moving left.

TEACHER SAY: **Great job. You have so many different strategies for solving addition problems. Take out your Mathematics Student Book and turn to page Lesson 55: Apply. Read the directions silently.**



STUDENTS DO: Turn to page Lesson 55: Apply in the student bookand read the directions to themselves.

TEACHER SAY: **Work independently to solve each of these problems using an addition strategy that works for you. Show your work in the box so that others can clearly see your thinking. Then choose two problems and solve them again using a different strategy. If you do not get the same answer, you might need to try a third strategy. If you finish early, try the Challenge problems.**



STUDENTS DO: Work independently to solve addition problems. Once finished, choose two problems to solve again using a different strategy. If time permits, work on the Challenge problems.

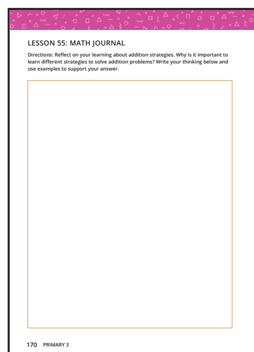
TEACHER DO: Walk around the class, observing students as they work. Take note of the strategies students seem to be using most. Offer assistance to students who are struggling and note who might need extra support reviewing addition strategies. When Learn is almost over, use an **Attention Getting Signal**.

TEACHER SAY: **You did a great job practicing addition review. I enjoyed seeing all of the different strategies you are using. Put away your books for Reflect and let's think about problem-solving strategies for a few minutes.**



Reflect (5 to 10 minutes)

Directions



LESSON 55: MATH JOURNAL

Directions: Reflect on your learning about addition strategies. Why is it important to learn different strategies to solve addition problems? Write your thinking below and use examples to support your answer.

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1. TEACHER SAY: **Turn to page Lesson 55: Math Journal in your book and read the journal prompt silently.**



STUDENTS DO: Turn to page Lesson 55: Math Journal and read the journal prompt to themselves.

TEACHER SAY: **Why is it important to learn different strategies to solve addition problems? Write your thinking in your book and use examples to support your answer.**



STUDENTS DO: Work independently to respond to the journal prompt in the student book.

TEACHER DO: At the end of the math lesson, collect students' books to read journal entries. The entries and examples will give you valuable information on current understanding of the importance of learning and using different problem-solving strategies.

Lesson 56 Overview

LESSON OVERVIEW

This lesson begins with a story problem that asks students to analyze data, estimate a sum, and agree or disagree with the solution stated. Then in Learn, students continue to practice addition strategies with up to four numbers using data from a variety of data tables. This lesson adds information to the Thinking Like a Mathematician anchor chart by discussing the importance of thinking abstractly and quantitatively to solve problems. It is important that students understand that there are multiple ways to find solutions to problems. Using symbols, pictures, or other representations allows students to use context skills.

LEARNING OBJECTIVES

Students will:

- Estimate the sum of two 3-digit numbers.
- Apply a variety of strategies to add two numbers up to four digits.

LESSON PREPARATION FOR THE TEACHER

- If you created an addition strategies poster in Lesson 55, have it available for this lesson along with the Thinking Like a Mathematician anchor chart.

KEY VOCABULARY

- Data
- Estimation
- Tables

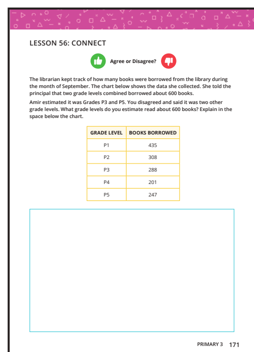
MATERIALS

- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions


LESSON 56: CONNECT

Agree or Disagree?

The librarian kept track of how many books were borrowed from the library during the month of September. The chart below shows the data she collected. She told the principal that two grade levels combined borrowed about 600 books.

Amir estimated it was Grades P3 and P5. You disagreed and said it was two other grade levels. What grade levels do you estimate read about 600 books? Explain in the space below the chart.

GRADE LEVEL	BOOKS BORROWED
P1	435
P2	308
P3	288
P4	201
P5	247

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1. **TEACHER SAY: Please open your Mathematics Student Book to page Lesson 56: Connect and read the problem on the page to yourself.**


STUDENTS DO: Turn to page Lesson 56: Connect and read the problem silently.

TEACHER DO: Make sure students understand the directions, particularly that they are to estimate to solve.

TEACHER SAY: Use the table to ESTIMATE which two classes read about 600 books. Record your thinking. When you are done, compare your answer with your Shoulder Partner's answer. Give me a Thumbs Up when you are ready to share your thinking.


STUDENTS DO: Estimate which two grades read about 600 books all together. Give a **Thumbs Up** when ready. Selected students share estimates and explain the strategies they used.

TEACHER DO: Ask questions to help students explain thinking, such as the following:

- What estimation strategy did you use?
  - Some students may use front-end estimation, looking at the first number only. Others may round to the nearest Hundred. Some students may not remember how to estimate and may just guess. That is okay at this time. Estimation will be reviewed in a later lesson.
  - Students may have different answers, so be sure they justify estimates. Grades P2 and P3 would get the closest to 600 at 596, but some students may have other ideas based on estimates.
- Why did you use that strategy?
- Which estimation strategy got us closest to the actual answer?
- Why do you think Amir thought it was Grades P3 and P5?

TEACHER SAY: Great job. Today we are going to look at some more data and practice using addition strategies. Keep out your student books.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Display the addition strategies chart you made in Lesson 55 (if you made a chart). Also, display the Thinking Like a Mathematician anchor chart if it is not already displayed.

TEACHER SAY: In our last math class, we reviewed addition strategies. Today we are going to continue to practice addition with large numbers. In Connect, Amir used estimation to try and determine which two classes read about 600 books. Amir's estimate was not the most accurate. Many of you thought Grades P2 and P3 was the better answer. Give a Thumbs Up if you found the exact number of books that Grades P3 and P5 read.



STUDENTS DO: Give a **Thumbs Up** if they added to find the exact number.

TEACHER SAY: Who would like to share an addition strategy?



STUDENTS DO: Raise hand to volunteer. Selected students explain the addition strategy they used.

TEACHER DO: Allow two or three different addition strategies to be shared.

TEACHER SAY: Great job. We have lots of strategies for solving problems, and this year we have an anchor chart to remind us of ways that we think like a mathematician. Can one volunteer read what we have written already?



STUDENTS DO: Raise hand to volunteer. Selected student reads aloud the Thinking Like a Mathematician chart.

TEACHER SAY: Good mathematicians also consider multiple strategies. They look at a problem and think about different ways to solve it. They might draw pictures or decompose the numbers in the problem into smaller numbers. Let's add to our chart, "Mathematicians have many ways to solve problems."

TEACHER DO: Record on the anchor chart.

LESSON 56: APPLY

Directions: Solve the following problems using a strategy that works well for you and your partner. Show all your work and thinking in the boxes below the questions. Remember to label your answers. When finished, place a star next to the most challenging problem.

Data Table 1: The table below shows the number of students in each grade level in a large school in Cairo. Use this information to answer the questions below.

GRADE	NUMBER OF STUDENTS
P1	272
P2	356
P3	529
P4	487

Questions:

How many students are P1 and P4 all together?

How many students are in P3 and P4 all together?

Fareed says there are more students in P1 and P3 then there are in P2 and P4. Do you agree or disagree? Prove your answer.

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TEACHER SAY: Today you will try a variety of strategies. You will work with a partner to read data tables and answer questions about them. Let's take a look now. Turn to page Lesson 56: Apply in your student book and look at the data tables.



STUDENTS DO: Turn to page Lesson 56: Apply and look at the data tables. These questions require you and your partner to practice using a variety of addition strategies and attend to accuracy. When you are finished, I want you to draw a star on the most challenging problem for you and your partner. If you finish early, try the Challenge problem. What questions do you have?



STUDENTS DO: Ask clarifying questions, if needed.

TEACHER DO: Use **Hands Up, Pair Up** to help students find partners.



STUDENTS DO: Work with a partner to solve the addition problems in the student book. Place a star next to the problem that was the most challenging. Students who finish early can work on the Challenge problem.

TEACHER DO: Walk around the room and observe students as they work. Check to see how they approach the problems. Note strategies demonstrated and ask them to explain why they used a certain strategy. Guide students to try new strategies and support those who may be struggling. At the end of Learn, use an **Attention Getting Signal** and remind students to place a star next to the most challenging problem.

TEACHER SAY: Great work today using your addition strategies to solve problems using data tables. Keep out your student books for Reflect.



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: In today's Reflect, you will be sharing the problem that you starred in your book. Go back to your own seat, turn to your Shoulder Partner, and decide who will share first. The first person discusses the problem they starred and why. The partner just listens. Remember that each person has a different understanding and level of challenge so listen respectfully. Then switch partners. This is not a time for you to solve each other's problems but to listen to each other. Listening to each other is a great way to learn new ways to solve problems.**



STUDENTS DO: Return to seats. Take turns with a **Shoulder Partner** sharing the problem that was the most challenging and why. Listen to each other respectfully.

TEACHER DO: Give 3 to 5 minutes for students to share work and listen.

TEACHER SAY: Nice job sharing and being respectful. We are a community of mathematicians and want to respect each other's thinking. Give your Shoulder Partner a high five and put away your books for today.



STUDENTS DO: Give a high five and put away supplies.

Lesson 57 Overview

LESSON OVERVIEW

This lesson begins with some quick multiplication or division practice using one of the listed activities that students have already been introduced to in the last two chapters. In Learn, students look at the relationship between addition and subtraction, explore subtraction strategies for large numbers, and then practice subtracting and checking with addition. The problems listed for students to subtract are ones that purposefully can be solved in a variety of ways, from mental math to number lines, place value pictures, and decomposing into place value. The standard algorithm for subtraction was introduced in Primary 2 and will be reviewed and practiced more later in Primary 3, but this lesson focuses on large numbers that are accessible to all students to build confidence with subtraction.

LEARNING OBJECTIVES

Students will:

- Explain the relationship between addition and subtraction.
- Apply strategies to subtract two numbers of up to four digits.
- Use addition to check answers to subtraction problems.

LESSON PREPARATION FOR THE TEACHER

No new preparation needed.

KEY VOCABULARY

- Difference
- Fact family
- Inverse operations
- Minuend

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

Note to the Teacher: Students have been introduced to a variety of quick multiplication and division practice activities in previous chapters. This Connect is therefore a review and practice. See Lesson 52 for detailed instructions.

1. **TEACHER DO:** Choose from one of the following activities for the Connect time.

- **Mystery Multiplication**
- **Roll and Draw** (Grid paper needed)
- **Share the Counters** (Counters needed)
- **Word Wizards**
- **Number Battle**—Each student gets a deck of number cards 0 to 12. Both decks are placed number side down between partners. Each student turns over the top two cards and multiplies them to find the product. Whoever has the greater product takes all four cards. Students continue until one player has no cards. They then reshuffle and play again until time is up.
- **Skip Counting**—Students play in pairs. Each pair receives one die or a set of number cards 0 to 12. One partner rolls the die or picks a card. The second partner states the first 12 multiples of the selected number. Students can use the 120 Chart if necessary for support.



STUDENTS DO: Work on the selected fact practice activity for the Connect time with a partner or independently.

TEACHER SAY: **Good work practicing your multiplication or division facts today.**

TEACHER DO: Collect any materials distributed to students.



Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Write the following problems on the board:

126 + 236 = ________   ________ – 126 = 236

TEACHER SAY: On the board are two problems. The first one is an addition problem where the sum is missing. The second one is a subtraction problem where the minuend is missing. Remember, the MINUEND is the number from which another number is to be subtracted. Work quietly for a minute to find the number that goes in each blank. When you have an answer, give me a Thumbs Up.

STUDENTS DO: Work independently to find the missing number in each problem (362). When finished, give a **Thumbs Up**. Selected students share answers and explain how it is possible that both blanks are the same number.

TEACHER SAY: Addition and subtraction are INVERSE OPERATIONS, or the opposites of each other. For example, to make this idea simpler, think about these problems.

TEACHER DO: Write the following on the board:

7 + 3 = ______   ______ – 3 = 7

TEACHER SAY: What number goes in each blank? Raise your hand when you know.

STUDENTS DO: Think quietly to solve the problem. Raise hand to volunteer. Selected student shares answers.

TEACHER SAY: Good job. In Primary 2, we referred to these numbers as a FACT FAMILY. What other equations could we write for this fact family? Raise your hand to share.

STUDENTS DO: Raise hand to volunteer. Selected students write the new equations on the board (3 + 7 = 10 and 10 – 7 = 3).

TEACHER SAY: Great. Knowing fact families can be helpful when checking our work. Let's look at this problem.

TEACHER DO: Record 572 – 350 = ______ on the board.

TEACHER SAY: Raise your hand if you would like to come to the front and show how you would solve this subtraction problem.

STUDENTS DO: Raise hand to volunteer. Selected student solves the problem at the board.

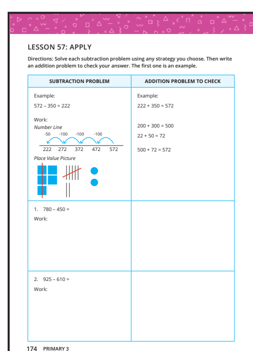
TEACHER DO: Ask for someone to share a different strategy.

TEACHER SAY: As with addition, we have many ways to subtract two numbers. I have a question for you. If 572 – 350 = 222, then does 222 + 350 = 572? Give me a Thumbs Up if you think it does. Give me a thumbs down if you think it does not.

STUDENTS DO: Give a **Thumbs Up** or thumbs down to show agreement or disagreement.

TEACHER DO: Ask for students to defend their choice, guiding them to explain that knowing that addition and subtraction are inverse operations can help us check an answer.

TEACHER SAY: The relationship between addition and subtraction can help us check our work and even help us decide how to solve problems. Today we are going to practice subtracting and then think about an addition problem that we could use to check our work. Please open your Mathematics Student Book to page Lesson 57: Apply and read the directions to yourself.



LESSON 57: APPLY

Directions: Solve each subtraction problem using any strategy you choose. Then write an addition problem to check your answer. The first one is an example.

SUBTRACTION PROBLEM	ADDITION PROBLEM TO CHECK
Example: 572 – 350 = 222 Work: *Number Line* -50 -100 -100 -100 222 272 372 472 572 *Place Value Picture*	Example: 222 + 350 = 572 200 + 300 = 500 22 + 50 = 72 500 + 72 = 572
1. 780 – 450 = Work:	
2. 925 – 610 = Work:	

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STUDENTS DO: Turn to page Lesson 57: Apply in the student book and read the directions silently.

TEACHER SAY: **In the first box you see the problem we did on the board. It is included here as an example. Below are examples of two ways to solve the example problem—a number line and a place value drawing. In the box to the right is the addition problem that proved that 572 – 350 = 222. 350 + 222 is 572 so the difference is correct. What questions do you have?**



STUDENTS DO: Ask clarifying questions, if needed.

TEACHER SAY: **Today you will work with your Shoulder Partner. You can see each other's thinking and learn from each other as you decide what strategies to use. If your partner has a strategy that you do not really understand yet, this is a chance to learn from them and practice other strategies. Remember, mathematicians are flexible thinkers.**

The subtraction problems are in the first column. There are six of them.

Show your work below the problem and then record an addition problem to prove your answer is correct in the box to the right. If your addition problem does not add up to the starting number—or minuend of the subtraction problem—you will know that you have made a mistake and can correct your work. If you finish early, you and your partner can try the Challenge problems. What questions do you have?



STUDENTS DO: Ask clarifying questions, if needed. Then spend the rest of Learn time working with a partner to solve subtraction problems and check work with an inverse addition problem. Students who finish early may work on the Challenge problems.

TEACHER DO: Walk around the room, observing students as they work. Take note of the strategies they use to subtract and whether or not they can add to check answers. Offer assistance where needed.

TEACHER SAY: **Great work. Put away your books for today.**



Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today we discussed the relationship between addition and subtraction. Turn to your Shoulder Partner and explain how understanding fact families or the relationship between addition and subtraction helps you solve challenging problems.**



STUDENTS DO: Talk to a **Shoulder Partner** about the inverse relationship between addition and subtraction.

TEACHER DO: After 1 to 2 minutes, call on several students to share thinking.



STUDENTS DO: Selected students share thinking and use examples to support their reasoning.

TEACHER SAY: **Nice job today. In our next math class, we will look at some addition and subtraction story problems.**

Lesson 58 Overview

LESSON OVERVIEW

In this lesson, students continue to practice addition and subtraction strategies as they solve a variety of story problems. The story problems can be solved using addition OR subtraction in some cases, so students have the flexibility to think about what works best for them to arrive at an answer. In Primary 2, there was a larger focus on learning problem-solving strategies. In Primary 3, the goal is for students to apply those strategies to solve problems involving larger numbers. Therefore, in Reflect, students rate current understanding of solving addition and subtraction problems with large numbers. The answers will help you determine which students would benefit from small-group instruction and practice in addition and subtraction. You may need to find additional class time to provide instruction and practice if most of the group is struggling or just needs more practice.

LEARNING OBJECTIVES

Students will:

- Apply strategies to solve addition and subtraction story problems.
- Reflect on learning to identify areas of strength and opportunities for growth.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, write the following story problem on the board:
  - Mr. Mahmoud raises chickens. In the past two years, his chickens have laid 5,350 eggs. Last year his chickens laid 2,120 eggs. How many eggs did his chickens lay two years ago?

KEY VOCABULARY

- Review vocabulary as needed.

MATERIALS

- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 58: Connect. You will see the same story problem that I have written on the board. Once you are on the page, read the problem to yourself.



STUDENTS DO: Turn to page Lesson 58: Connect and read the story problem silently.

TEACHER SAY: Below the problem are two different ways students thought about solving this story problem. Read the problem and then decide if you would solve this problem using addition or subtraction. Circle the strategy that seems to make the most sense to you. When you are ready to share your reasoning, raise your hand.



STUDENTS DO: Reflect on the story problem and circle the problem- solving strategy that makes the most sense to them. Raise hand to volunteer. Selected students identify a chosen strategy and explain reasoning.

TEACHER DO: Be sure to call on students who selected addition and students who selected subtraction. There is no one right way to solve this problem.

TEACHER SAY: Great job. This problem can be solved in a variety of ways. Both strategies arrived at a correct answer. Today we will look at some more story problems and think about what strategies we use to solve different types of problems. Keep out your student book for Learn.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: For Connect we looked at two different ways to solve the problem on the board, but I am wondering if anyone would solve it a different way. Raise your hand if you have a different way of solving this story problem and can explain your thinking on the board for the class to see.



STUDENTS DO: Raise hand to volunteer. Selected students offer alternative strategies to solve the story problem, explain thinking to the class, and show the strategy on the board.

TEACHER DO: Call on students who have a different strategy.

LESSON 58: APPLY

Directions: Read each story problem and decide on a strategy to solve it. Show your work in the box below each problem. Some of the problems might have more than one step. Read carefully.

Example:

Mr. Mahmoud also raises sheep. One day he took 235 sheep out to graze on a hill. Later, his neighbor brought his sheep to the hillside to graze. Now there are 680 sheep on the hill. How many sheep did the neighbor bring to the hillside?

Practice:

1. The library can hold 2,475 books, but 525 books are out on loan and 137 books are missing. How many books are there in the library right now?

2. Three boxes filled with books were just delivered to the library. If each box is filled with 215 books, how many books were delivered?

3. The librarian takes some of the new books out of the boxes. Now there are only 510 books in the boxes. How many books did the librarian take out of the boxes?

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TEACHER SAY: Nice work. For the past three math classes, we have worked on addition and subtraction strategies. We discussed many different strategies. Today we will look at how we apply those strategies in context. We are going to solve a variety of story problems with a partner. It will be up to you to decide how to solve and then work to find a solution. Let's look at another story problem together. Turn in your student book to page Lesson 58: Apply and read the example story problem. Then think about how you would solve this problem. Give a Thumbs Up when finished.



STUDENTS DO: Turn to page Lesson 58: Apply and read through the story problem in the student book. Think of a strategy to solve and give a **Thumbs Up** when ready.

TEACHER SAY: Stand up if you would use an addition strategy to solve this problem and can share it with the group.

TEACHER DO: Call on a student who is standing to share a strategy and solution. Repeat the process, having students stand who might use subtraction to solve.



STUDENTS DO: Selected students share strategies.

TEACHER SAY: This story problem and the one in Connect both entailed a missing part. For both problems, we could use addition or subtraction to find the missing part. Not all story problems will have only one way to solve. Today you will have problems to work through with your Shoulder Partner. Read carefully and determine what is the best strategy for you to use. You and your partner can try the same strategy or different strategies. Be sure to show your thinking in the space below each story problem so I can see your strategies. Are there any questions?



STUDENTS DO: Ask clarifying questions if needed and then work with a **Shoulder Partner** to solve the story problems in the student book.

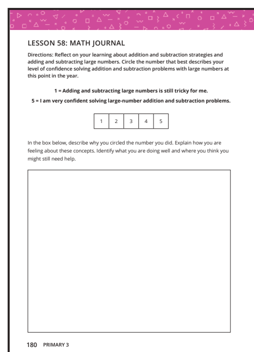
TEACHER DO: Walk around the room, observing students as they work. Offer help when necessary. Take note of what strategies students use to solve problems. Additional time to review strategies may be needed in future lessons if students seem to really be struggling or if students are mostly just drawing place value pictures. Students in Primary 3 need to be developing more efficient strategies to solve problems with large numbers.

TEACHER SAY: Great work today using addition and subtraction strategies to solve story problems. Keep out your student book for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 58: MATH JOURNAL

Directions: Reflect on your learning about addition and subtraction strategies and adding and subtracting large numbers. Circle the number that best describes your level of confidence solving addition and subtraction problems with large numbers at this point in the year.

1 = Adding and subtracting large numbers is still tricky for me.

5 = I am very confident solving large-number addition and subtraction problems.

1	2	3	4	5

In the box below, describe why you circled the number you did. Explain how you are feeling about these concepts. Identify what you are doing well and where you think you might still need help.

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1. **TEACHER SAY: For the past couple of lessons, we have reviewed addition and subtraction strategies and used them to solve story problems. In our next lesson, we will start a new topic in math, so today I would like you to take time to reflect on your understanding. Remember, this is called metacognition. Turn to page Lesson 58: Math Journal and read the directions, but do not begin working.**



STUDENTS DO: Turn to page Lesson 58: Math Journal in the book and read the directions silently.

TEACHER DO: Read the directions aloud and explain the meaning of the rating scale.

TEACHER SAY: After you circle a number, describe why you circled the number you did. Explain in your own words how you are feeling about these concepts, where you are doing well, and where you think you might still need support from me. You will not be sharing your journal with a partner.



STUDENTS DO: Reflect on learning and then rate current understanding of concepts from the past three lessons. Explain why they chose the number that they did.

TEACHER DO: Give students 2 to 3 minutes to write. Collect students' books. Be sure to read entries as they will provide valuable information about students' current confidence level with addition and subtraction strategies as well as adding and subtracting large numbers.

TEACHER SAY: This year there will be many opportunities to reflect on our learning and many opportunities to keep practicing and growing as mathematicians. Give yourself a pat on the back for trying your best.



STUDENTS DO: Pat themselves on the back.

Lesson 59 Overview

LESSON OVERVIEW

In this lesson, students are introduced to liquid volume as a measurement of capacity. To support learning, they make connections to what they already know about measuring length and mass. They activate background knowledge, or schema, by brainstorming common liquid items and what they already know about milliliter and liter measurements. They visually see how many milliliters are in a liter and practice when to measure in milliliters and when to measure in liters. The goal of this lesson and the next is to build students' familiarity with the meaning of volume, how it is measured, and how volume measurements are read. They do not have to build the same level of skill in measuring volume as they have with length and mass.

LEARNING OBJECTIVES

Students will:

- Define volume as the measurement of the capacity of a container.
- Explain the relationship between milliliters and liters.
- Estimate the size of a milliliter of water.
- Identify the best unit to measure the volume of a given container.

LESSON PREPARATION FOR THE TEACHER

- Have available a large piece of chart paper to record students' thinking about volume.
- Create a large ten frame on chart paper. See Chapter Preparation for Lesson 59 for an example, if needed.
- Have available 10 clear cups with the 100-milliliter mark labeled (small enough to sit on ten frame).
- Have available one 1-liter container.
    - Fill the container with 1 liter of water.

KEY VOCABULARY

- Capacity
- Liter
- Milliliter
- Schema
- Volume

MATERIALS

- Chart paper
- One large ten frame on chart paper
- 10 clear cups with the 100-milliliter mark labeled
- One 1-liter container, filled with 1 liter of water
- Scissors (one per student)
- Glue (one per student)
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Display a blank sheet of chart paper to record the discussion for today's Learn. It will be referred to in Lesson 60 as well.

TEACHER SAY: Today we are going to begin a new topic. Please think about things we have measured this year. Give me a Thumbs Up to share.



STUDENTS DO: Think quietly. Give a **Thumbs Up** to volunteer. Selected students share answers.

TEACHER DO: Call on several students to share thinking. The responses should include the measurement of length and may include time if students think of telling time as a form of measurement. Ask students questions such as:

- What types of tools are used to measure length? (rulers)
- What units are used? (millimeters, centimeters, meters, and kilometers)
- What types of tools are used to measure time? (clocks)
- What units are used? (seconds, minutes, hours, days, weeks, months, years, and so on)

TEACHER SAY: Today we are going to learn about measuring liquids and how to tell how much liquid a container can hold. Who can remind us what a liquid is?

TEACHER DO: Use **Calling Sticks** to select students to explain what a liquid is.

TEACHER SAY: Let's Brainstorm some liquids that you know about that are stored in containers. Think about the liquids you may have at your house or buy at the store. Raise your hand when you have an idea. I will call on one of you and then you will Popcorn to another student.



STUDENTS DO: Raise hand to volunteer. Share answer and then **Popcorn** to another student until the teacher stops the sharing.

TEACHER DO: Record students' ideas on the chart paper. They may include things like water, juice, liquid soap, and so on. Ask them additional questions, such as:

- How are some of these liquids packaged?
- Which holds more, a bottle of soda or a tank of petrol?
- Can you name any of the units used for liquid measurement?

TEACHER SAY: Great job thinking about what you already know about liquids in our everyday lives. Activating your background knowledge, or SCHEMA, or the information you already know before new learning, gets your brain warmed up to learn new material. Today we will be learning more about liquid volume.



Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: We already know that liquids are substances that can take the shape of their container. Volume is the measurement of how much a container can hold. Please Whisper, "Volume," into your hands.



STUDENTS DO: Whisper: volume.

TEACHER DO: Hold up the 1-liter container of water.

TEACHER SAY: I have 1 liter of water in this container. This container holds 1 liter of water. It is filled to capacity. A container's CAPACITY is the total amount of liquid it can hold. Since this container holds 1 liter of liquid and it is full, the container is filled to its capacity. A few minutes ago, we talked about the units of length that we know. A kilometer can be broken into smaller units called meters. A meter can be broken into smaller units called centimeters. And a centimeter can be broken into smaller units called millimeters. It is the same with volume measurements. We can take 1 liter and break it into smaller units. Right now, we will break our liter into 10 parts.

TEACHER DO: Display the ten frame on a table or on the floor where all students can see. Select a student to help you put one cup in each rectangle on the frame.

TEACHER SAY: Who can help me fill up each cup to show 100 milliliters? Raise your hand.



STUDENTS DO: Raise hand to volunteer. Selected student (or students) fill each cup up to the 100 milliliter mark.

TEACHER SAY: We divided up 1 liter of water equally into 10 cups. Each cup now contains 100 milliliters of water. If these cups each hold 100 milliliters, how big do you think 1 milliliter is? Show me with your fingers.



STUDENTS DO: Estimate the size of 1 milliliter of water and show estimate using fingers.

TEACHER SAY: The metric measurement system is amazing. Hold your fingers about 1 centimeter apart. Imagine you are holding a tiny clear box that measures 1 centimeter on every side. That box would hold 1 milliliter of water. It would take 1,000 of those boxes to fill a 1-liter bottle of water. Let's skip count by 100s and find the total number of milliliters on the ten frame. Count with me.



STUDENTS DO: Count aloud with the teacher: 100; 200; 300; 400; 500; 600; 700; 800; 900; 1,000.

TEACHER SAY: **How many milliliters are in 1 liter? Call out together.**



STUDENTS DO: Call out: 1,000.

TEACHER SAY: **Yes, it takes 1,000 milliliters to make 1 liter. Can you think of a way to write how many milliliters of water we have on the ten frame as a multiplication equation? Raise your hand if you have an idea.**



STUDENTS DO: Raise hand to volunteer. Selected students share thinking and record equations on the board, if asked.

TEACHER DO: If students struggle, help them to see that there are ten 100-milliliter cups. The equation should be 10 × 100 mL = 1,000 mL.



LESSON 59: APPLY

Directions: Cut out the pictures below and then sort them according to whether the liquid volume is best measured in milliliters or liters. When you and your Shoulder Partner are finished, compare your answers. Discuss any areas of disagreement.

Petrol in a car	Soda in a can	Spoonful of medicine
Dishwashing soap	Water in a bottle	Shampoo in a bottle
Juice in a juice box	Water in the bathtub	

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TEACHER SAY: **Please take out your Mathematics Student Book and turn to page Lesson 59: Apply and read the directions to yourself.**



STUDENTS DO: Open the student books to page Lesson 59: Apply and read the directions silently.

TEACHER SAY: **Let's think together for a moment. You can measure any length or distance in millimeters, centimeters, meters, or kilometers, but sometimes there is a unit that is best or easiest to use. For example, if we were going to measure the length of the Nile River, should we use centimeters, meters, or kilometers?**



STUDENTS DO: Call out answers.

TEACHER SAY: **It is a long, long distance, so if you said kilometers, I agree with you. If we were going to measure the length of one of our feet, should we use centimeters or meters?**



STUDENTS DO: Call out answers.

TEACHER SAY: **Our feet are not very long, so if you said centimeters, I agree with you. It is the same with volume. We can use milliliters or liters to measure the volume of anything, and sometimes a container will show milliliter measurement AND liter measurement. But sometimes it is best to use one unit over the other.**

TEACHER DO: Make sure students understand the directions. Distribute scissors and glue and have students begin working.



STUDENTS DO: Cut out the objects and determine if liquid volume should be measured in milliliters or liters. Glue answers into the student book. When finished, compare answers with a **Shoulder Partner**.

TEACHER DO: Walk around the classroom and observe students as they work and compare answers. Some of the items may have more than one potential answer, so it will be interesting to listen to students' reasoning for decisions. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: **Please keep your student books out for Reflect. You may look at your book to help you answer questions and share your thinking.**



Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: You did a nice job today sorting items according to the unit of liquid volume measurement you would use. Were there any liquids that you felt could be measured in either milliliters or liters? Please raise your hand to share your thinking.**



STUDENTS DO: Raise hand to volunteer. Selected students share thinking and explain reasoning (and examples, if possible).

TEACHER DO: Call on several students to share to ensure that students have an opportunity to learn from others and clear up any lingering misunderstandings they may have about milliliters and liters. It will also help them see that sometimes the volume of containers could be measured in both units.

TEACHER SAY: You did a wonderful job today of using your measurement schema, or background knowledge, and applying it to new learning about milliliters and liters. When you are at home or at a shop, notice other items that have liquid volumes. Look at the containers and see if they are measured in milliliters or liters or both.

Lesson 60 Overview

LESSON OVERVIEW

In today's lesson, students begin by solving a story problem that combines knowledge of milliliters and liters, work with multiplying by 10, and abstract thinking skills. In Learn, they will practice reading volume measurements using the correct unit on standard labeled containers to build understanding of units of volume and how they compare to each other.

LEARNING OBJECTIVES

Students will:

- Read volume measurements on a standard labeled container.
- Write what they have learned about volume measurement.

LESSON PREPARATION FOR THE TEACHER

Prior to the lesson, gather several containers with milliliter and/or liter volume measurements on the labels. See Chapter Preparation for Lesson 60 for examples.

KEY VOCABULARY

- Capacity
- Liter
- Milliliter
- Volume

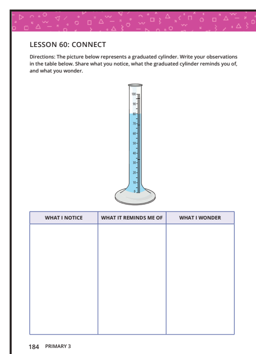
MATERIALS

- Variety of containers labeled in milliliters and/or milliliters
- Mathematics Student Book and pencil



Connect (10 to 15 minutes)

Directions



1. TEACHER SAY: **Today our goal is to practice reading volume measurements and to build our understanding of milliliters and liters and how they are related to each other. Scientists use a tool called a graduated cylinder to measure liquids. A graduated cylinder has tiny lines marking each milliliter of liquid. Since scientists must make accurate measurements, it is important for their tools to be precise. We are going to pretend to be scientists using mathematics for a moment. Please turn in your Mathematics Student Book to page Lesson 60: Connect and look at the image of a graduated cylinder.**

 STUDENTS DO: Turn to page Lesson 60: Connect and look at the graduated cylinder.

TEACHER SAY: **Take a few minutes to observe the image and then fill in the chart to share your observations. Record what you see, what it reminds you of, and what you wonder about graduated cylinders.**

 STUDENTS DO: Work independently in the student book to record observations in the table.

TEACHER DO: After a few minutes, call on several students to share observations. They may notice things like the following:

- It looks like a ruler.
- There are hash marks like a ruler.
- There are different numbers at the bottom and top.
- The numbers listed are skip counted by 10s.
- There are 80 milliliters of liquid in the graduated cylinder.



Learn (35 to 45 minutes)

Directions

1. **TEACHER SAY: What is the total capacity of this graduated cylinder? Whisper the answer into your hand.**

 **STUDENTS DO: Whisper**: 100.

TEACHER SAY: How do you know? Give me a Thumbs Up if you can explain your thinking.

 **STUDENTS DO:** Give a **Thumbs Up** to volunteer. Selected students explain thinking.

TEACHER SAY: Let's read the numbers listed on the graduated cylinder together: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

 **STUDENTS DO:** Skip count aloud with the teacher.

TEACHER SAY: What do you notice about these numbers? Turn and Talk to your Shoulder Partner.

 **STUDENTS DO:** Talk to a partner to share observations.

TEACHER DO: Call on a student to share that they are skip counted by 10s. Ask students to think about what the hash marks in between the numbers should be and repeat the process of talking to a **Shoulder Partner** and sharing with the class.

TEACHER SAY: Just like on a ruler, not all measurements are listed. Each line on the graduated cylinder represents 1 milliliter. Scientists use graduated cylinders all the time, but we see and use other kinds of volume measurements every day. Today we are going to practice reading those measurements and recording our findings.

TEACHER DO: Direct students' attention to the collection of containers you have gathered.

TEACHER SAY: We are going to have some fun today exploring volume measurements and reading the volume of containers we see in our everyday lives. Before we begin, who can remind us what volume means?

TEACHER DO: Use **Calling Sticks** to select students to see if they can explain volume. Repeat for capacity.

 **STUDENTS DO:** Selected students share definitions of volume and capacity. Students make ask a friend for help, if needed.

TEACHER SAY: I am going to divide you into groups. Each group will receive a set of containers. You will take turns reading aloud the volume measurement of each container. Then you will record in your student book the type of container and its volume. You will also draw a quick picture of the shape of the container. Be sure to include the unit label. Turn to page Lesson 60: Apply in your student book now.

 **STUDENTS DO:** Turn to page Lesson 60: Apply in the student book.

TEACHER DO: Make sure students understand the directions: read aloud the volume of each container and then record the container, draw a quick picture of its shape, and write its volume in the table in the book.

TEACHER SAY: The goal is for you to become familiar with volume measurements so you have a sense of 1 liter, 750 milliliters, 500 milliliters, 25 milliliters, and so on. When I give the signal, you will trade containers with another group and continue working. We will do this until we run out of time. What questions do you have?

 **STUDENTS DO:** Ask clarifying questions, if needed.

TEACHER DO: Assign students to groups and distribute a set of containers to each group. Have students begin working. After it appears most groups have finished, use an **Attention Getting Signal** and have groups trade containers and continue working.



STUDENTS DO: Read volume measurements on standard labeled containers and record the containers and measurements in the book.

TEACHER DO: At the end of Learn, use an **Attention Getting Signal** and have volunteers return the containers to you. Have all students return to seats for Reflect.



Reflect (5 to 10 minutes)

Directions



LESSON 60: MATH JOURNAL

Directions: Reflect on your learning about volume. Imagine you were going to teach a Primary 2 friend everything you know about volume.

In the box below, write what you know about volume: what it is, how to find it, the units we use, how the units compare to each other, containers that use volume measurements, and so on. Use words, pictures, and/or numbers to share your thinking.

PRIMARY 3 187

1. **TEACHER SAY: Please turn in your student book to page Lesson 60: Math Journal and read the directions to yourself.**



STUDENTS DO: Turn to page lesson 60: Math Journal and read the directions silently.

TEACHER SAY: How would you explain what you know about volume to a friend in Primary 2? In the box on the journal page, write what you know about volume: what it is, how to find it, the units we use, how the units compare to each other, containers that use volume measurements, and so on. Use words, pictures, and numbers to share your thinking.



STUDENTS DO: Work independently to respond to the journal prompt in the student book.

TEACHER DO: Collect students' books and read entries to gather information about current levels of understanding of volume. Take note of any serious misconceptions and correct them during the next math lesson.

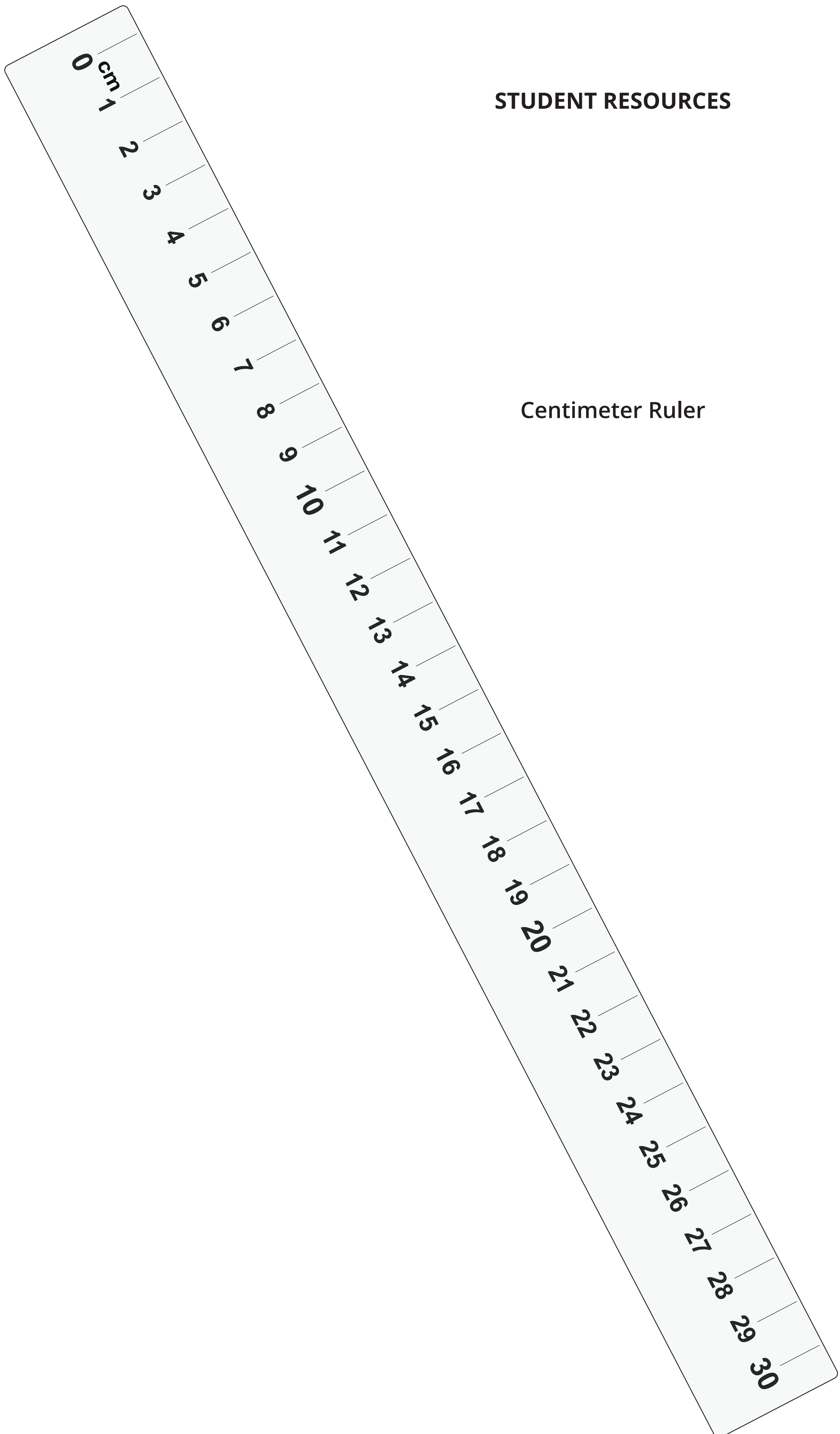
TEACHER SAY: That was a lot of fun. Now you know about measuring length, mass, time, and volume. You are becoming great mathematicians. Give yourself a hug.



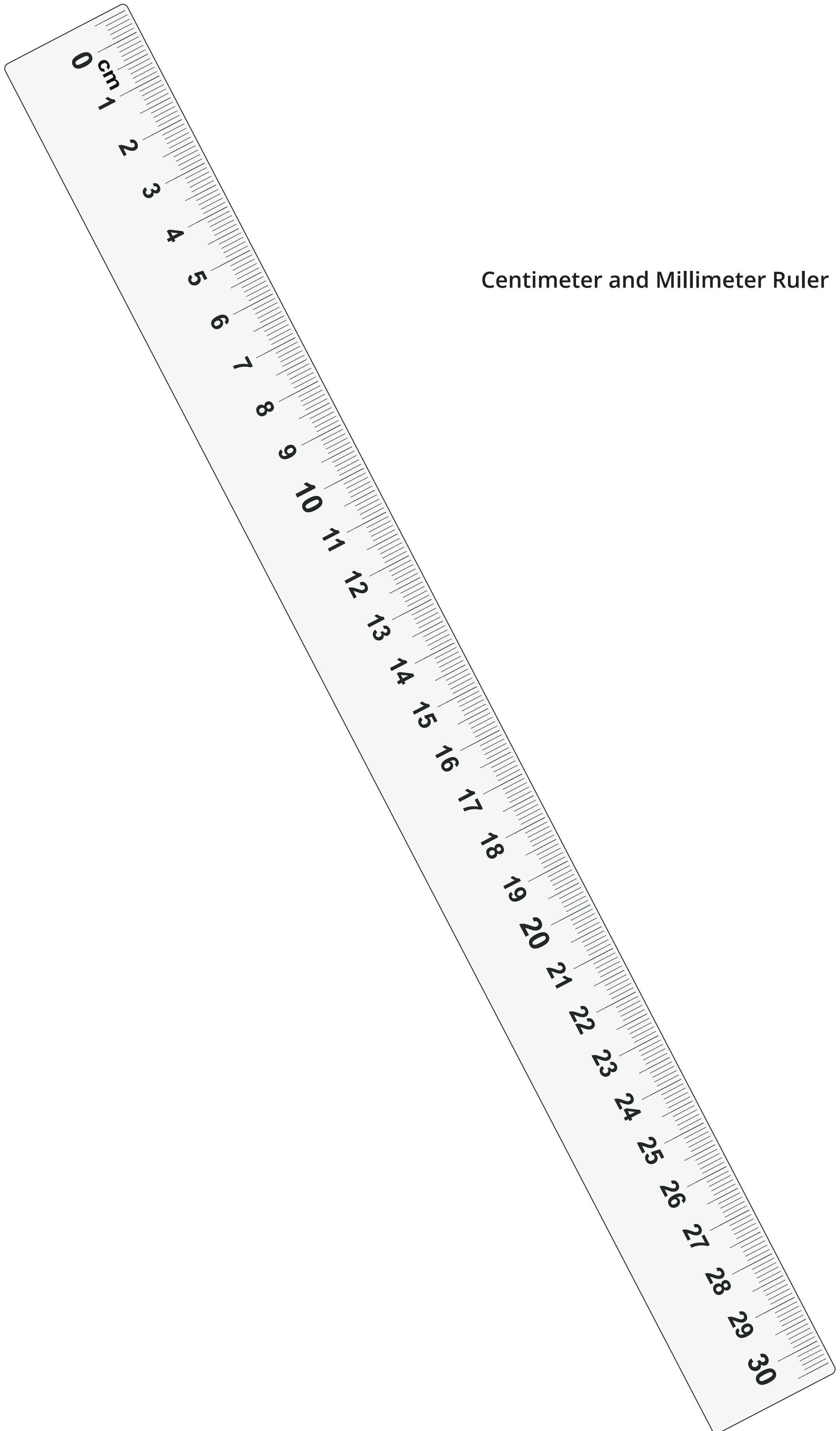
STUDENTS DO: Hug themselves.

Student Resources

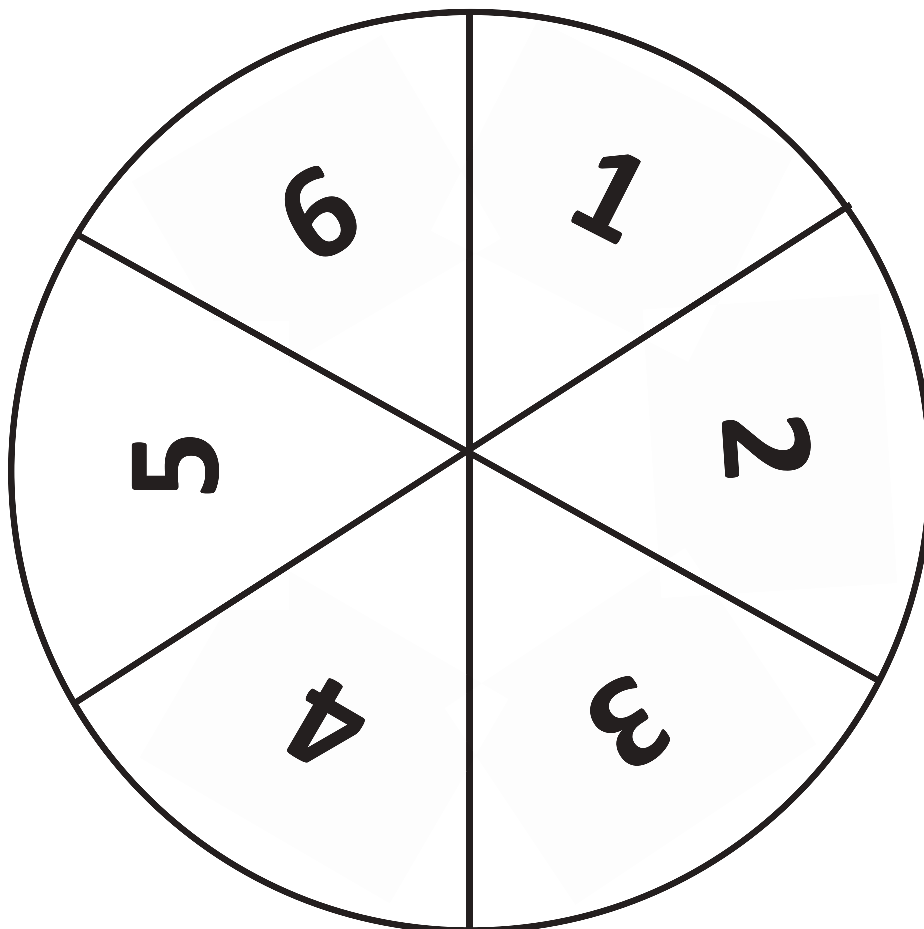
Centimeter Ruler

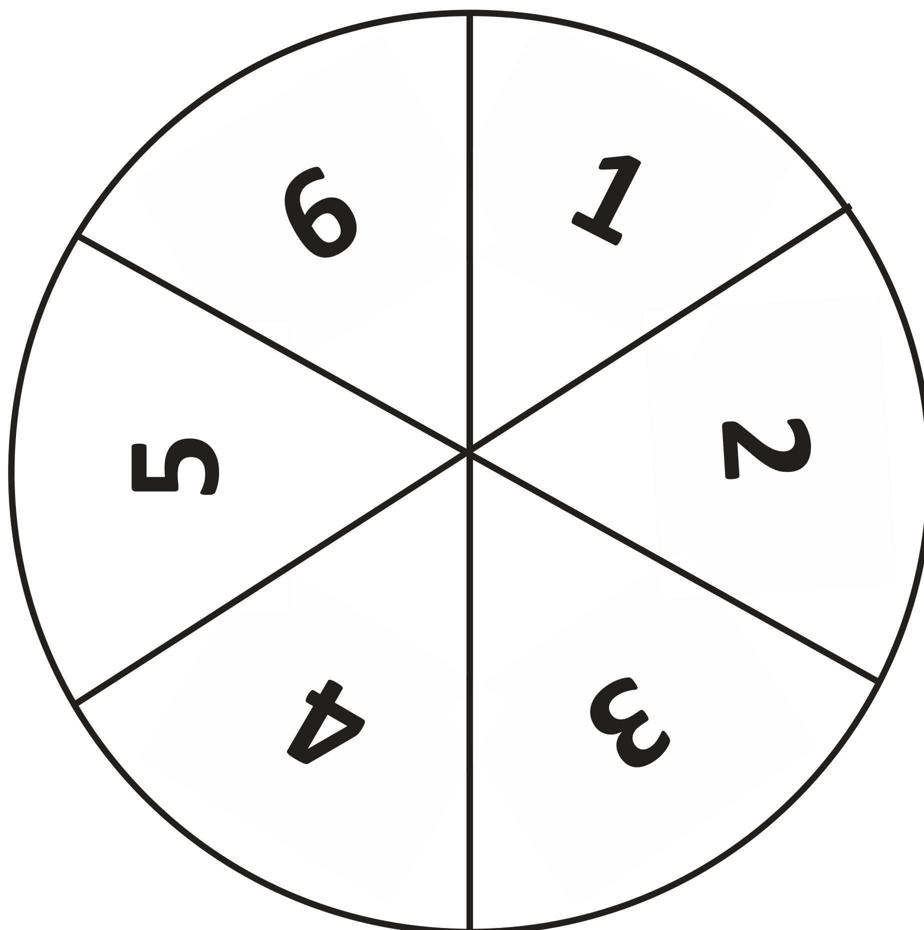


Centimeter and Millimeter Ruler

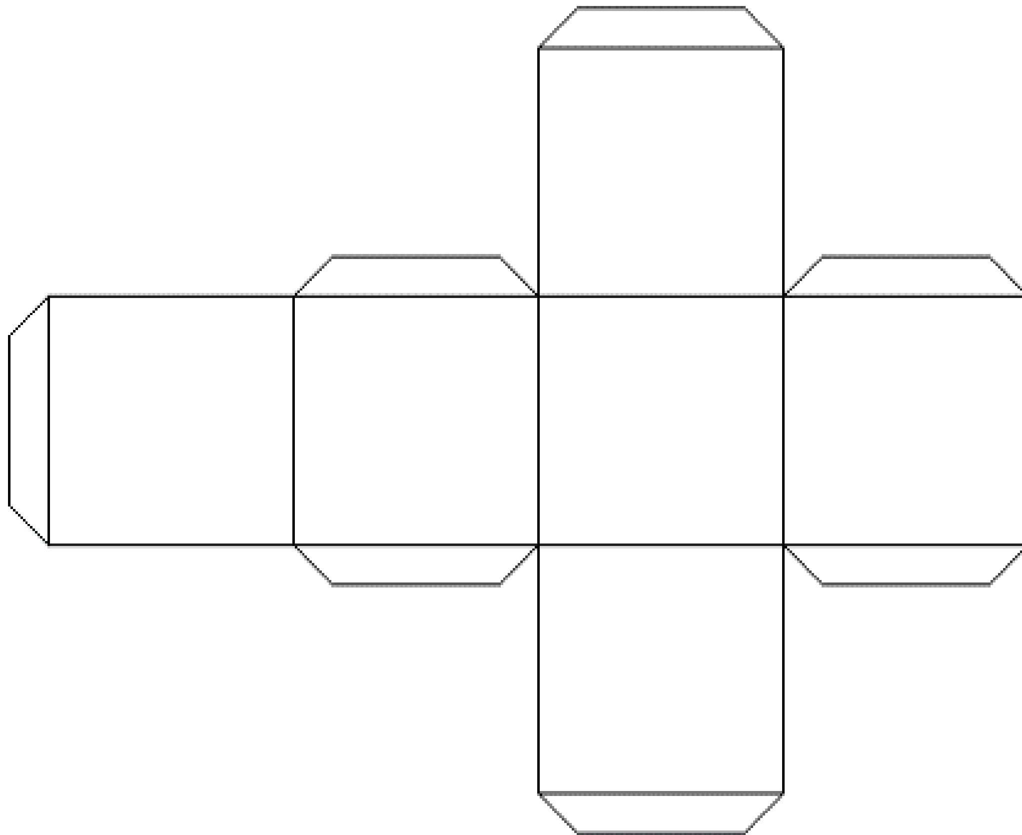


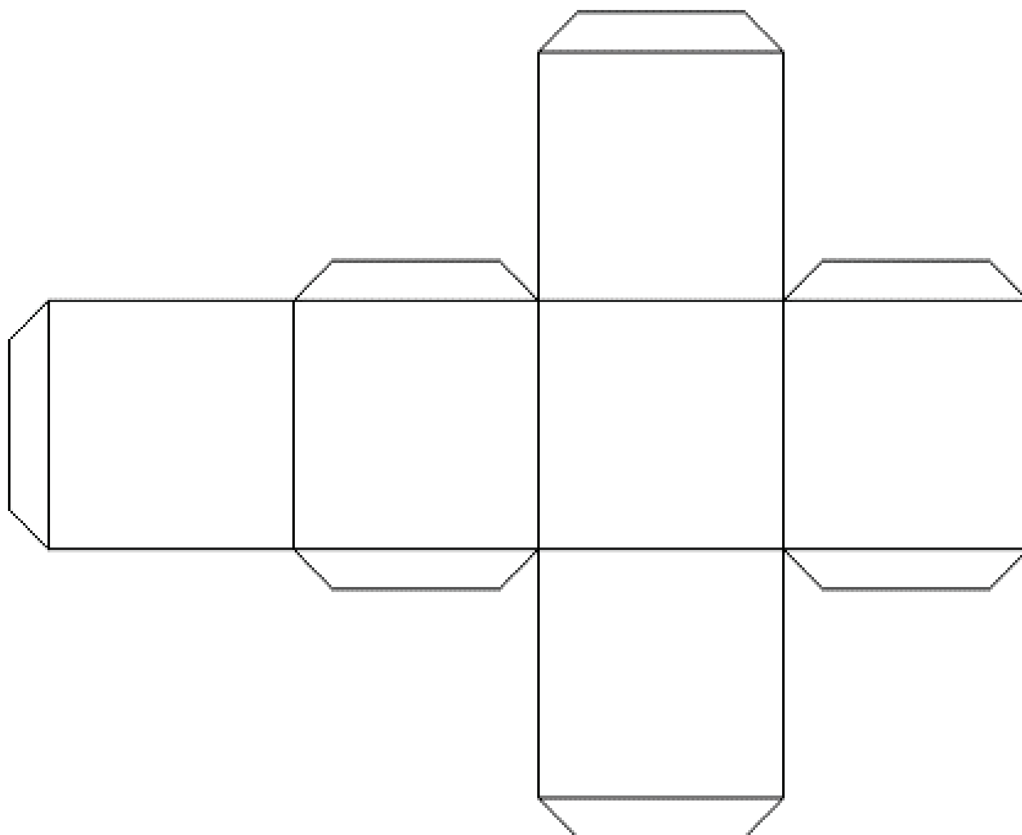
6 Spinner Template





6-Sided Die or Number Cube Net



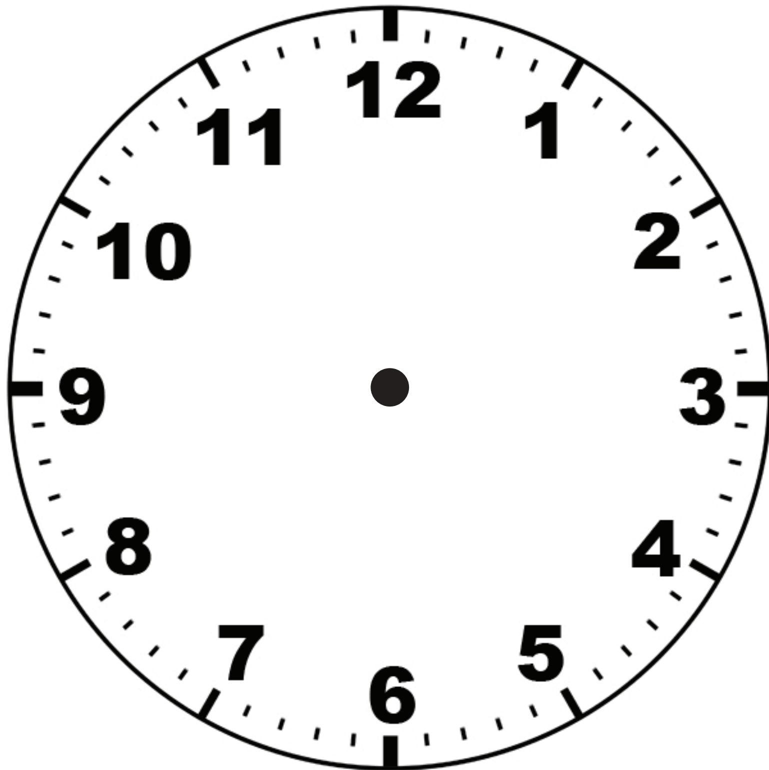


Analog Clock Face – Large



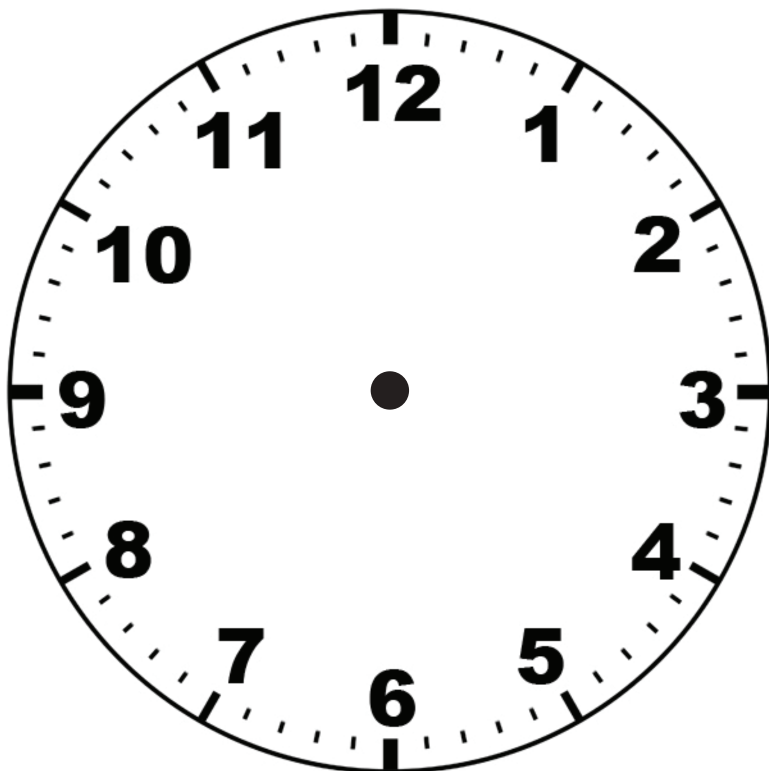


Analog Clock Face – Small









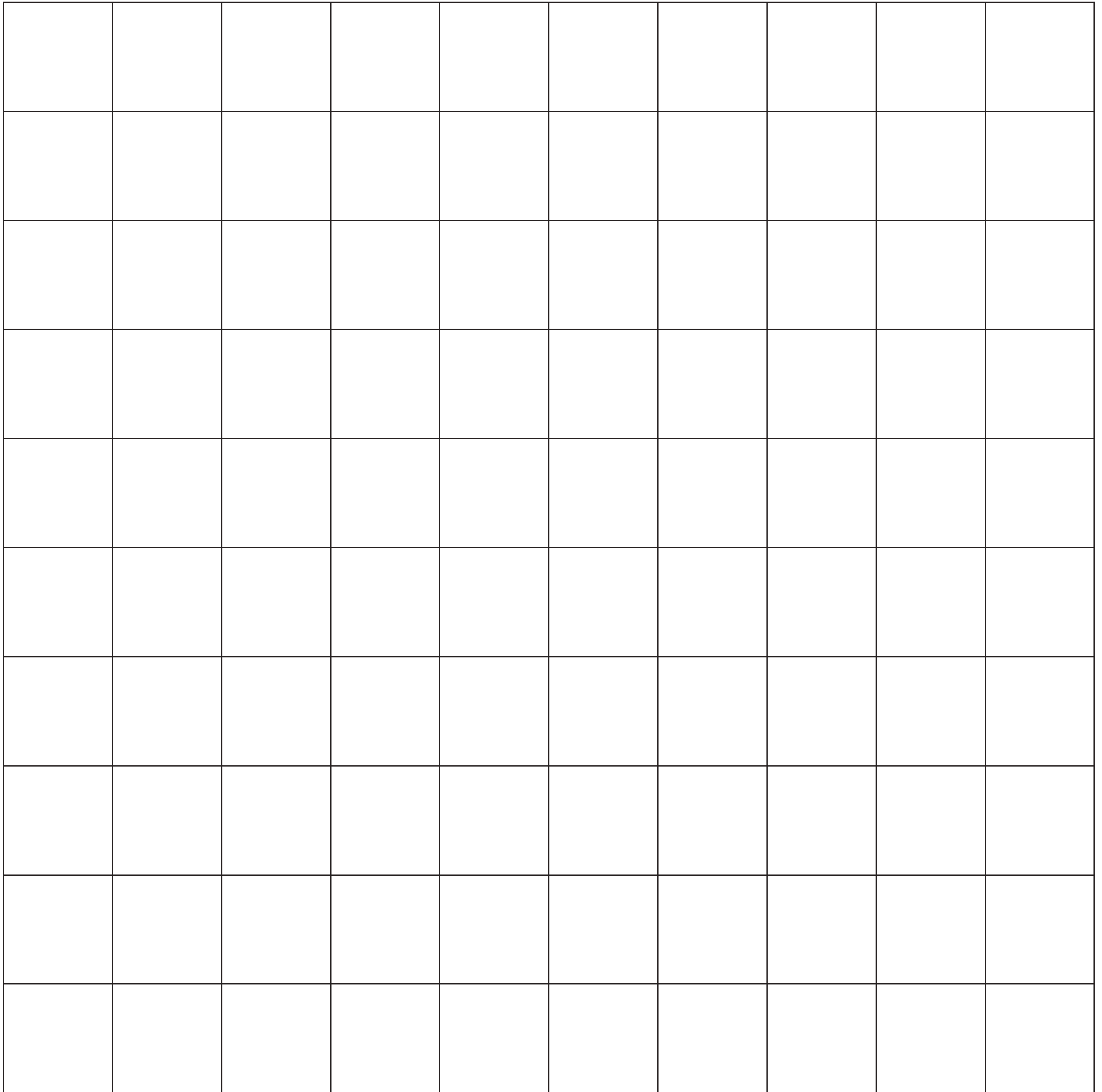




Arranging Chairs Game Cards

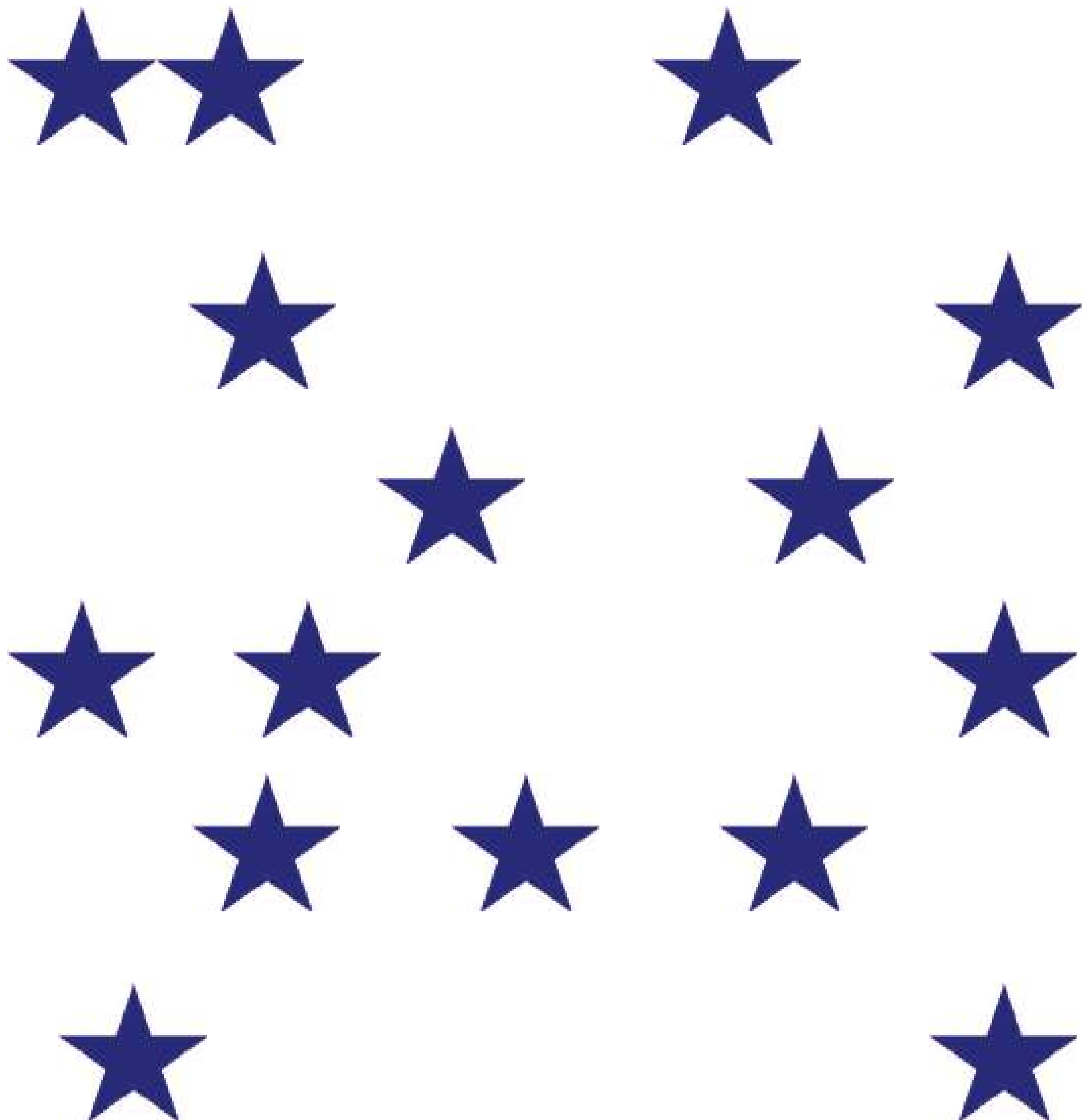
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18	19	21	24	25
26	27	28	29	30
32	33	35	36	48
8	12	13	14	15
18	19	21	24	25
26	27	28	29	30
32	33	35	36	48

ARRAY BLOCKS GAME BOARD



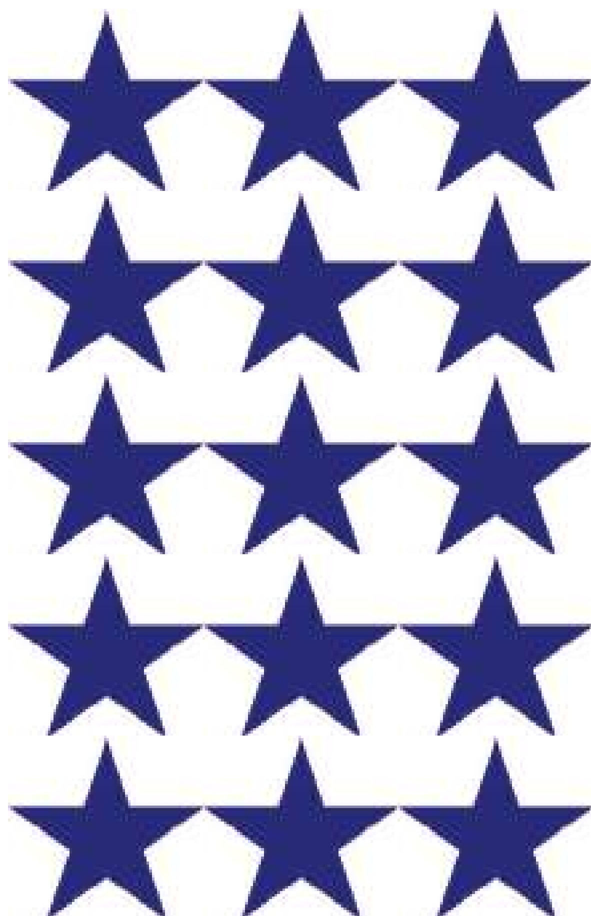
Array Cards

Star Array Card 1



How many stars are on this page?

Star Array Card 2

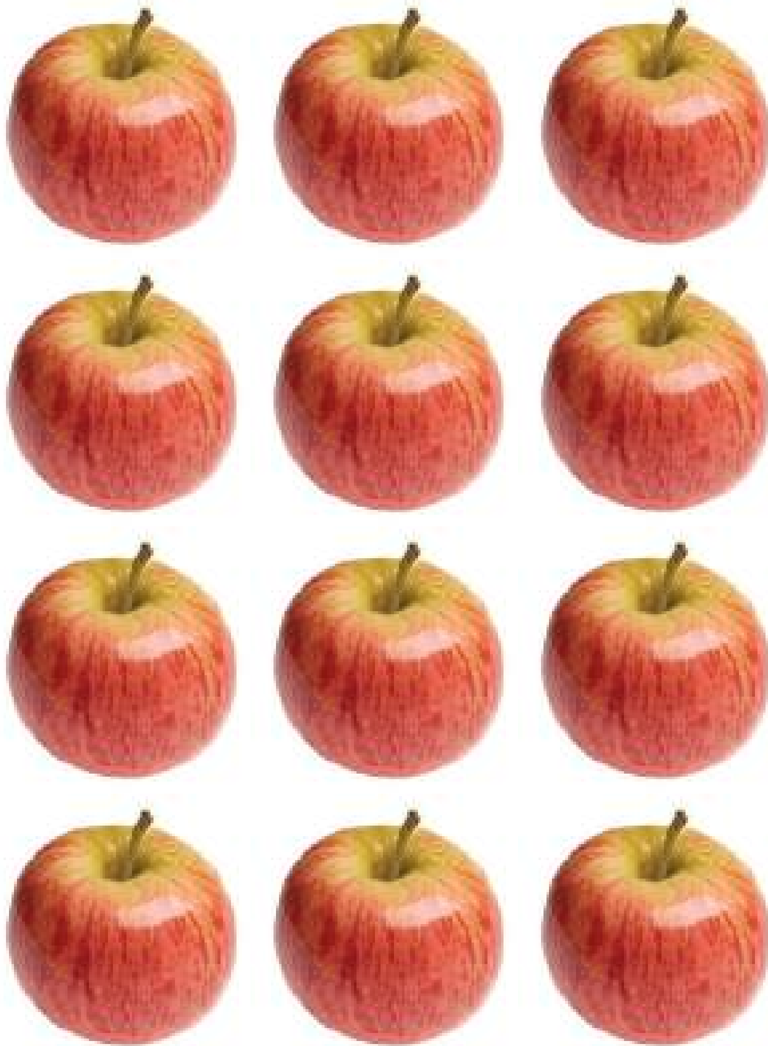


Number of Rows: ___________

Number in each row: ____________

How many stars are on this page? _____________

Apple Array Card

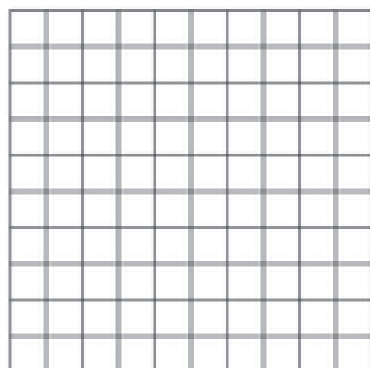
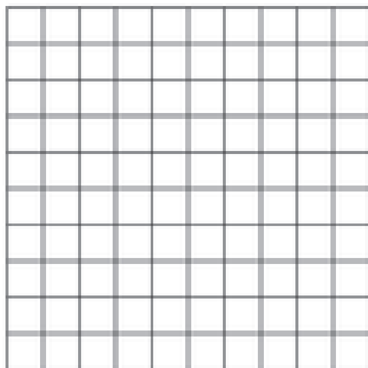
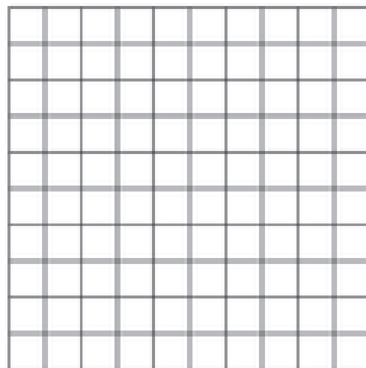
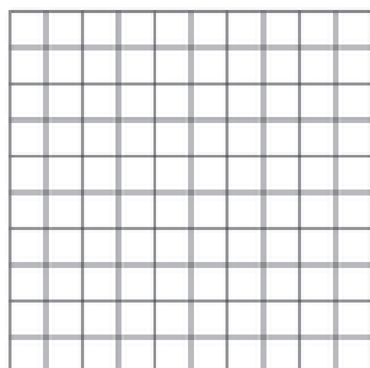
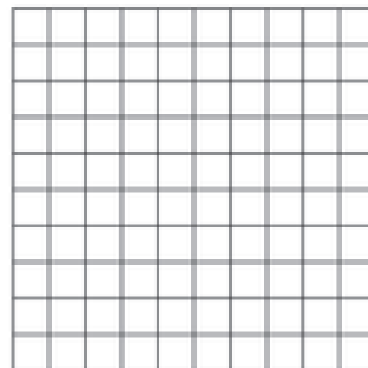
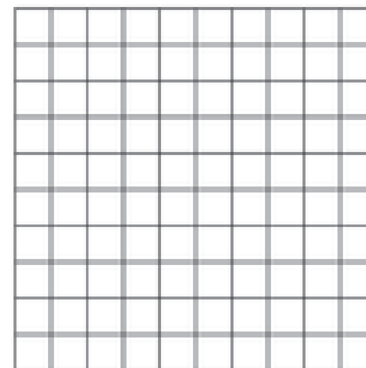
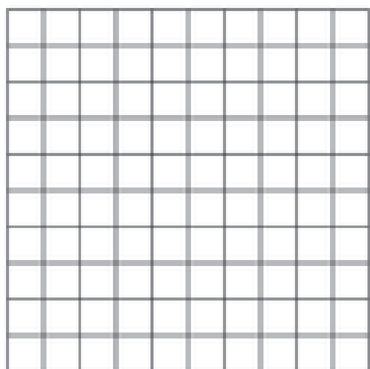
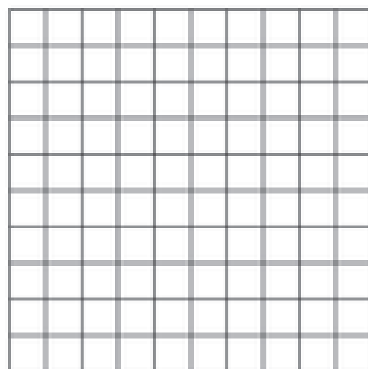
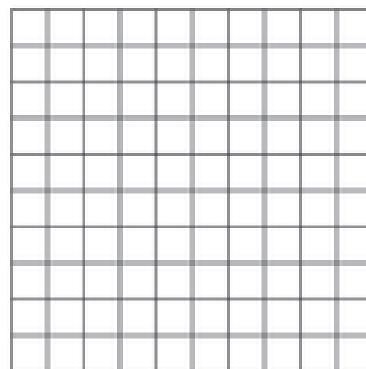


Can Array Card

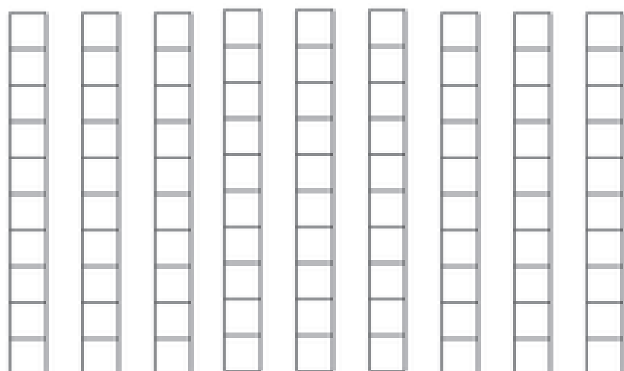


Array Grid

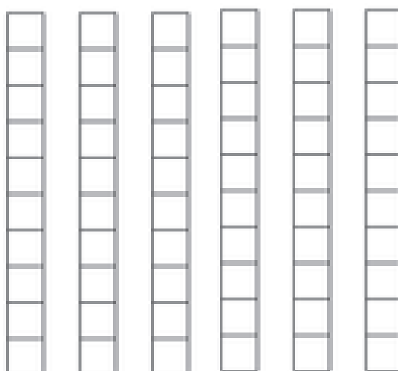
Base Ten Manipulatives – Student

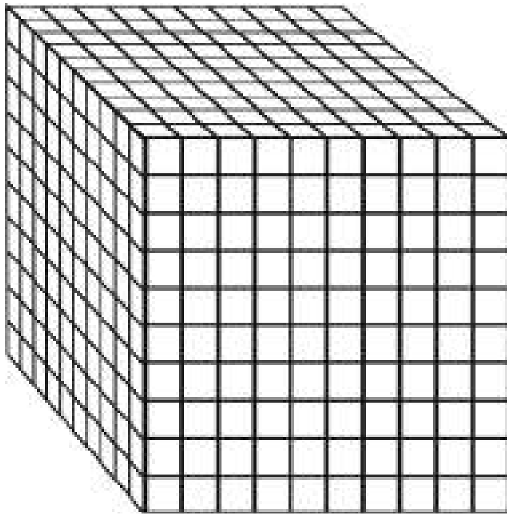
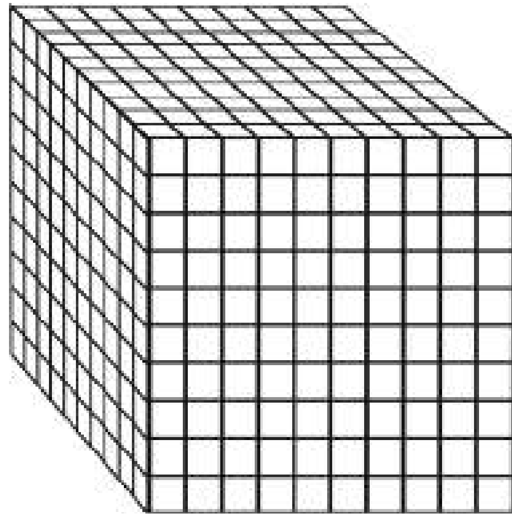
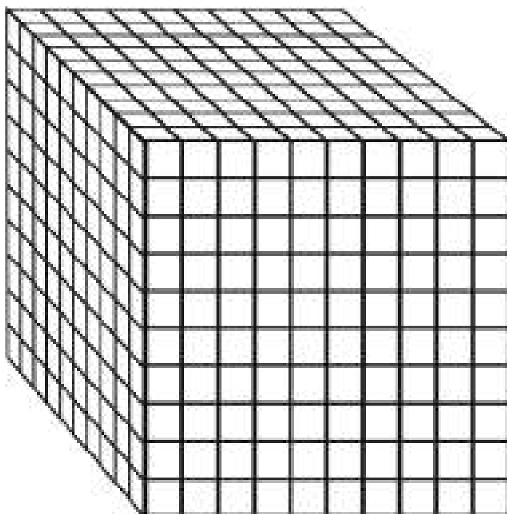
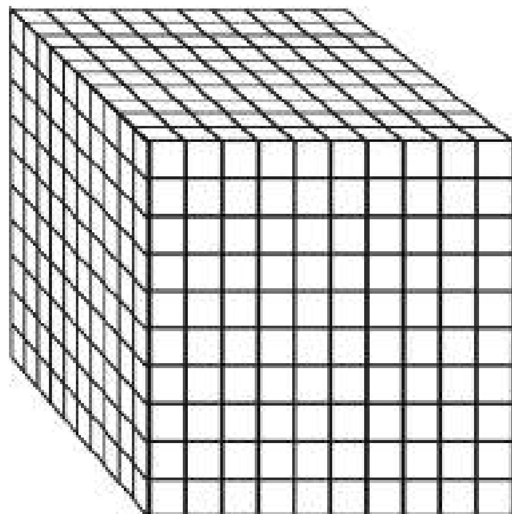
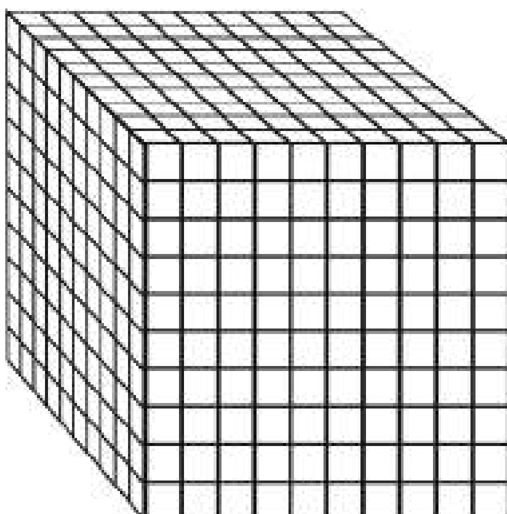
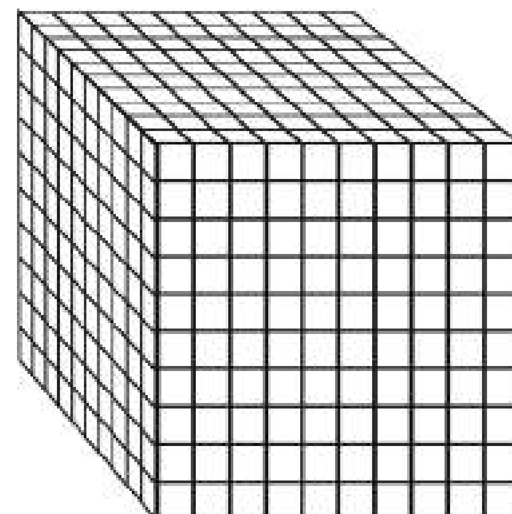










Tens



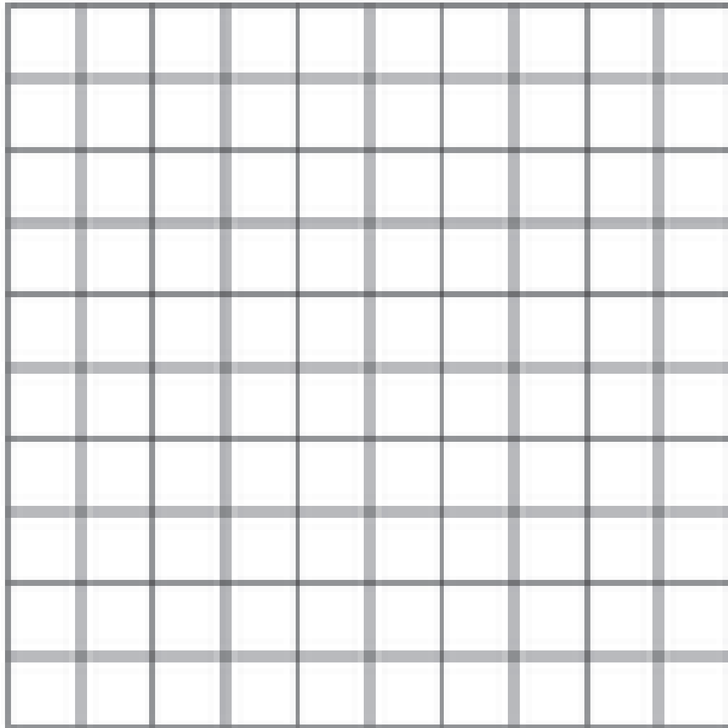
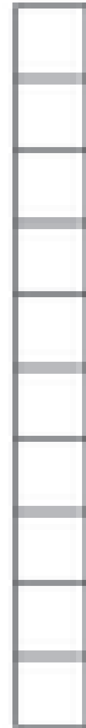
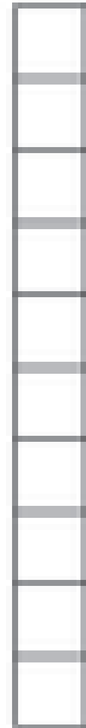
Ones (cut into squares)

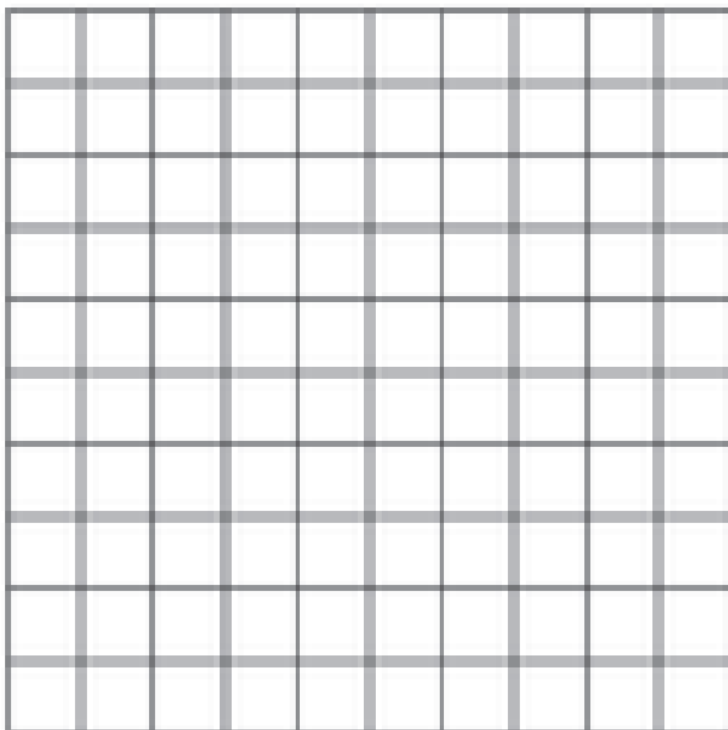
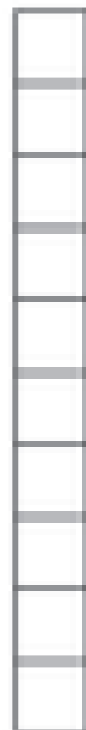
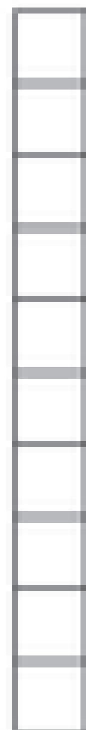


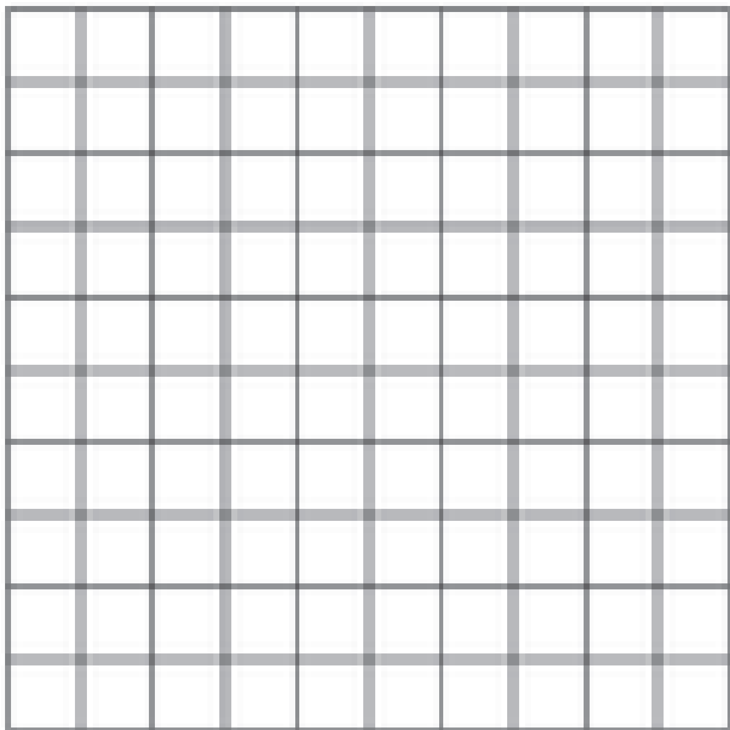
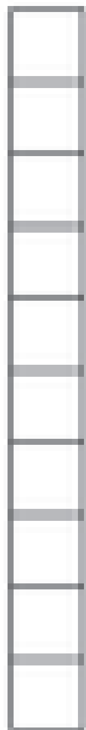
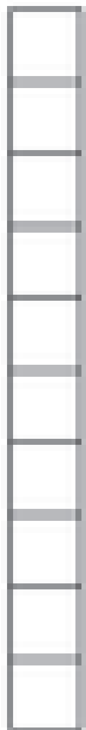
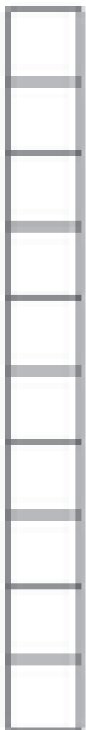
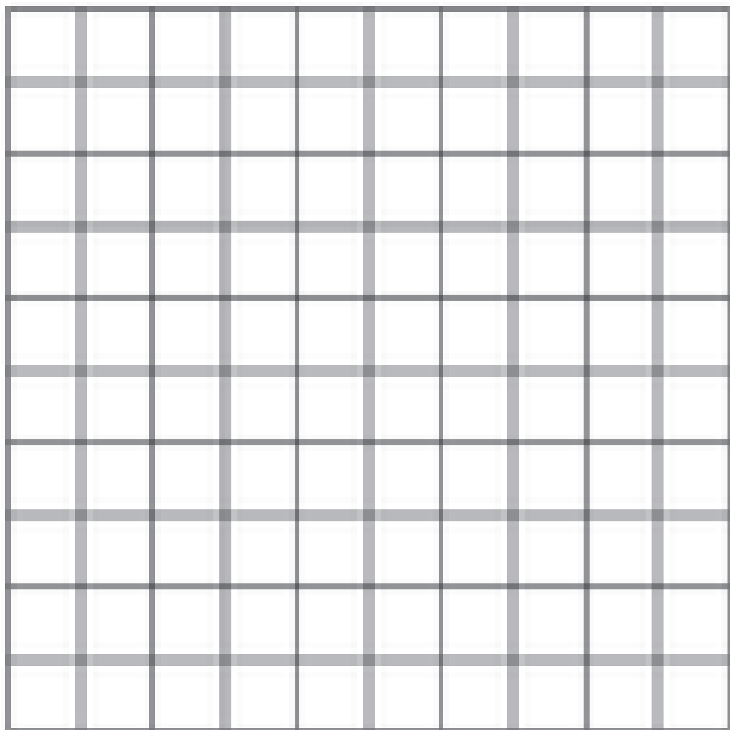
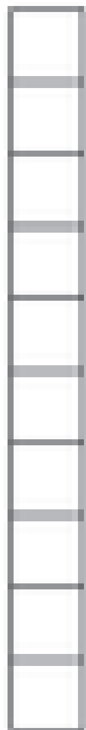
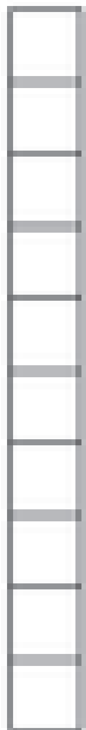
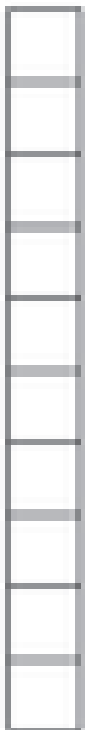







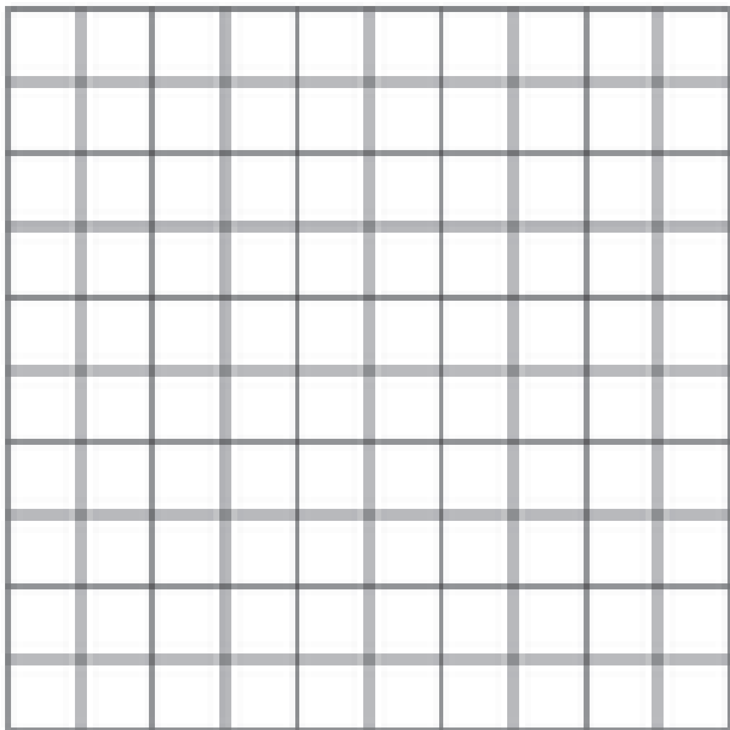
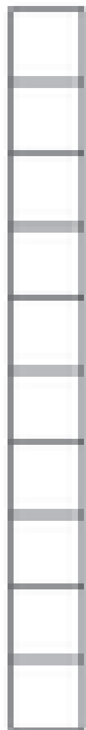
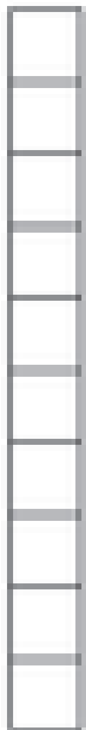
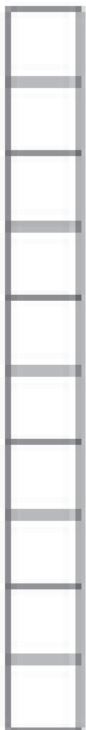
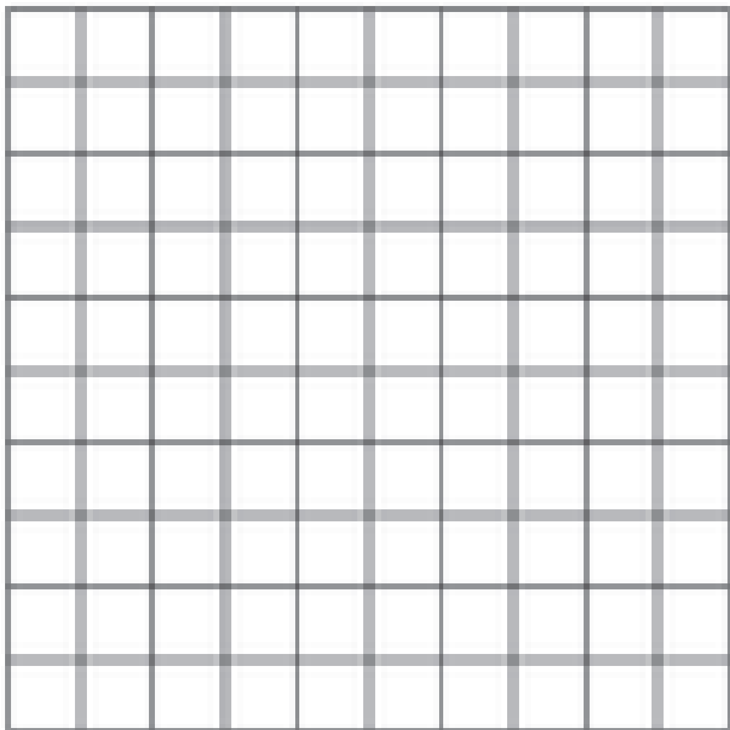
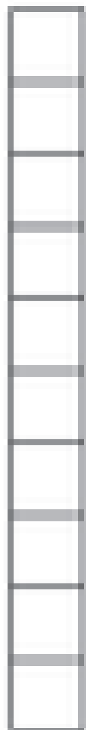
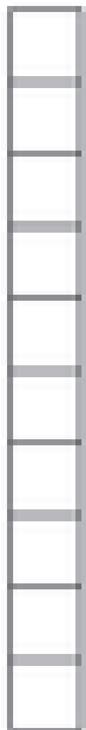
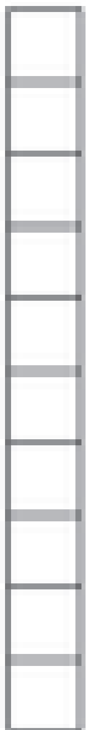
Base Ten Manipulatives – Teacher

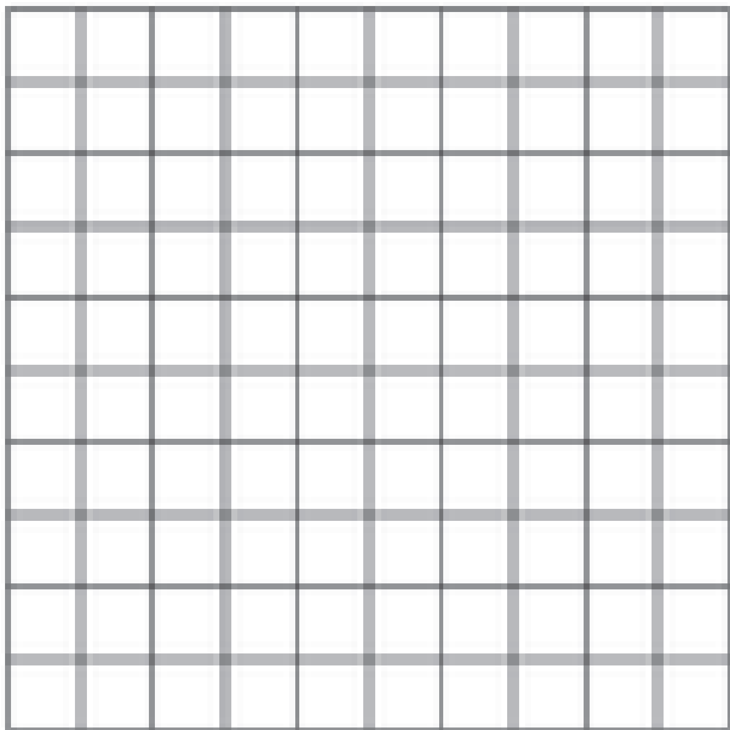
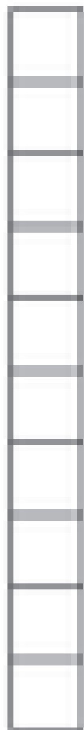
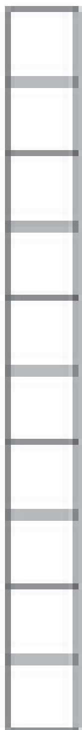
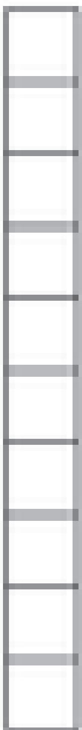
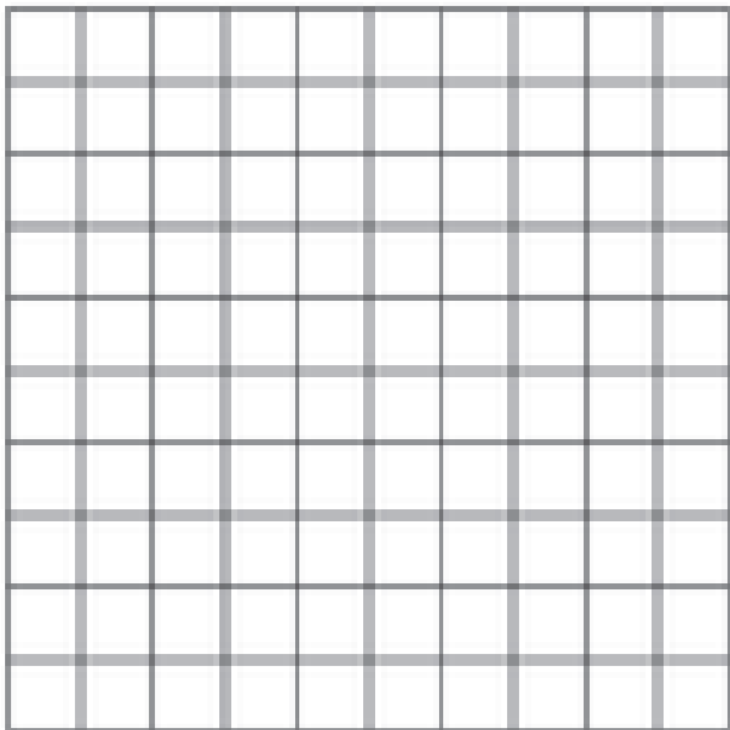
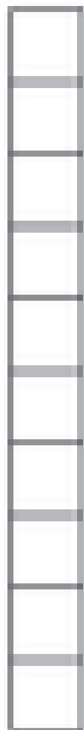
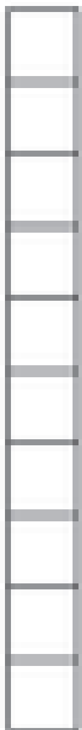
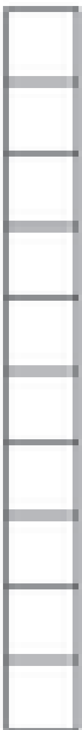
Large squares = 100
Strips = 10
Cut some strips into squares to create 1s

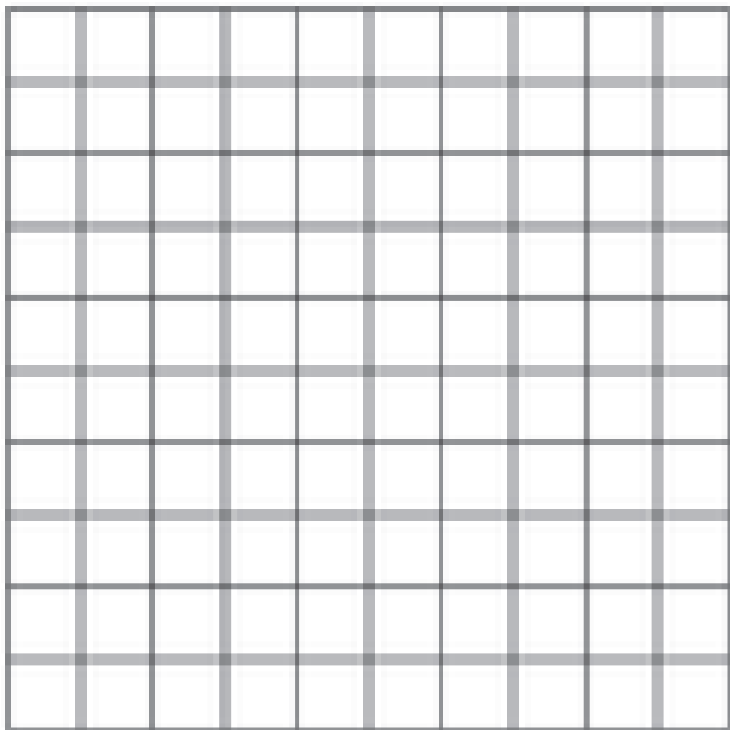
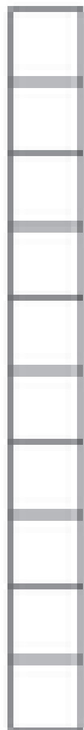
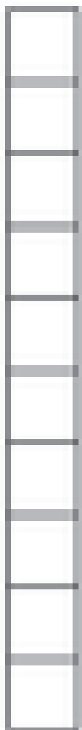
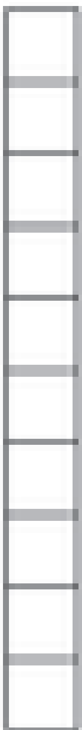
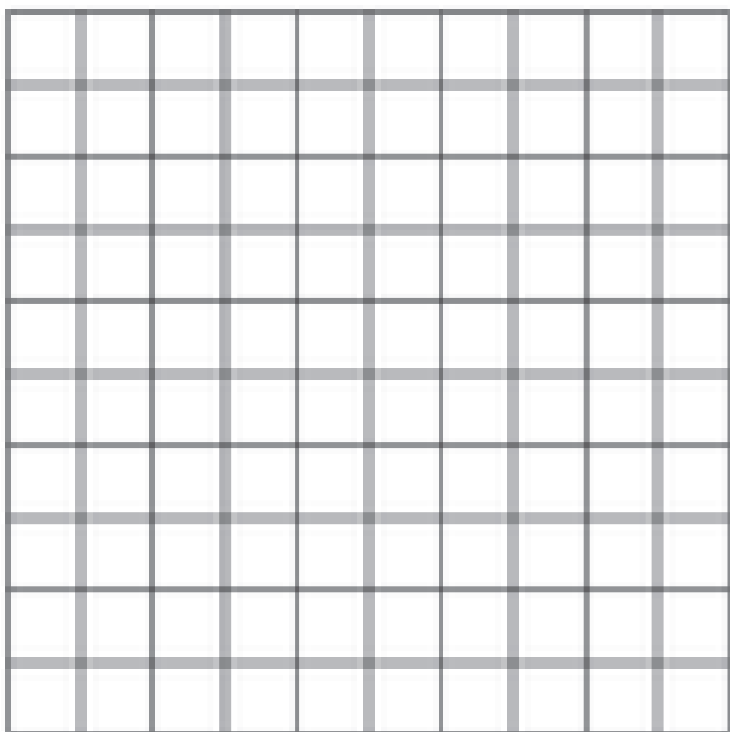
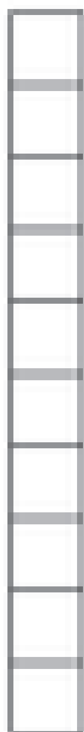
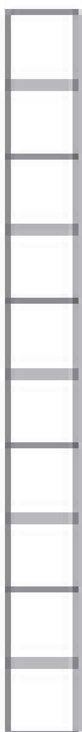
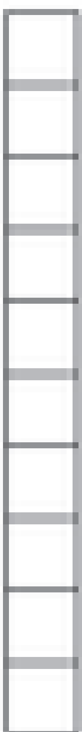




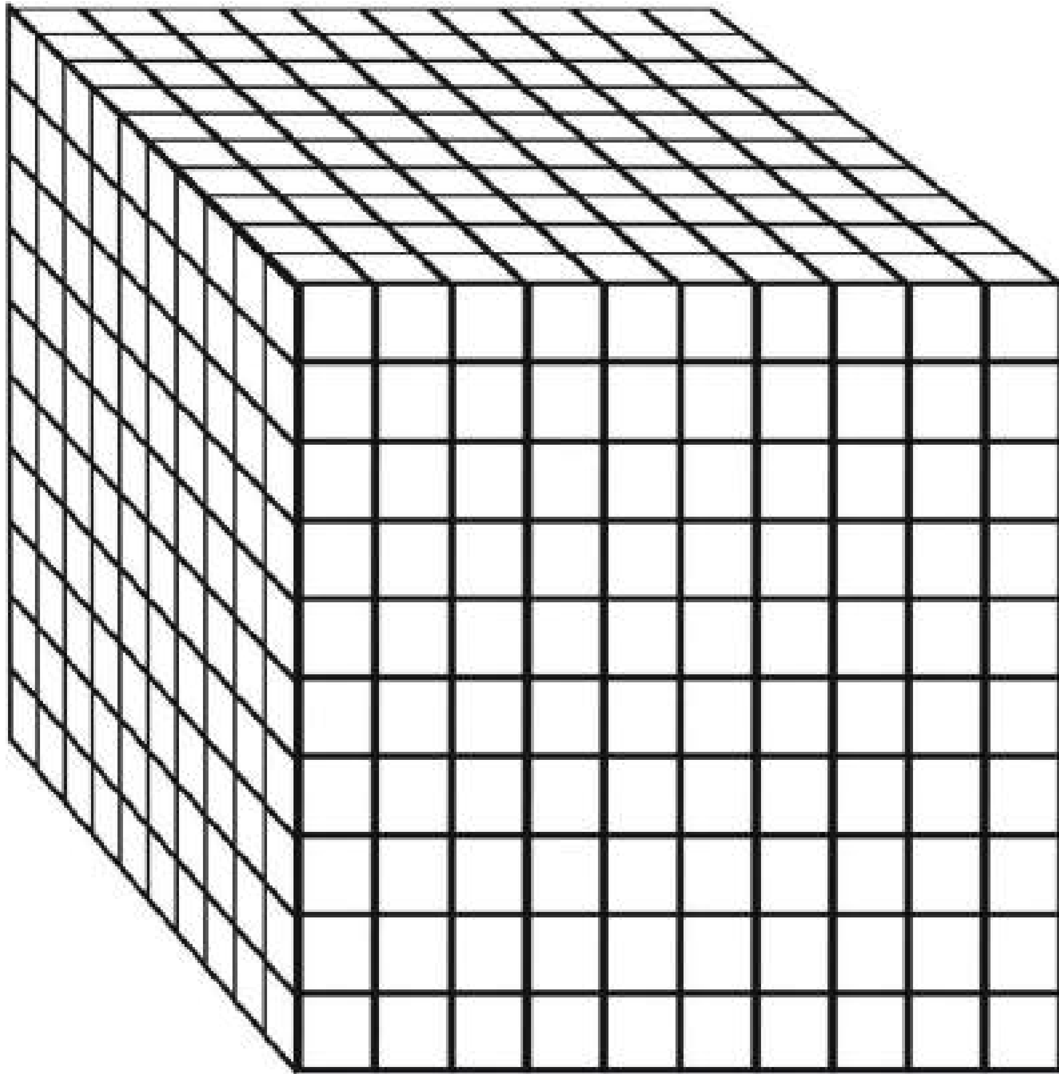





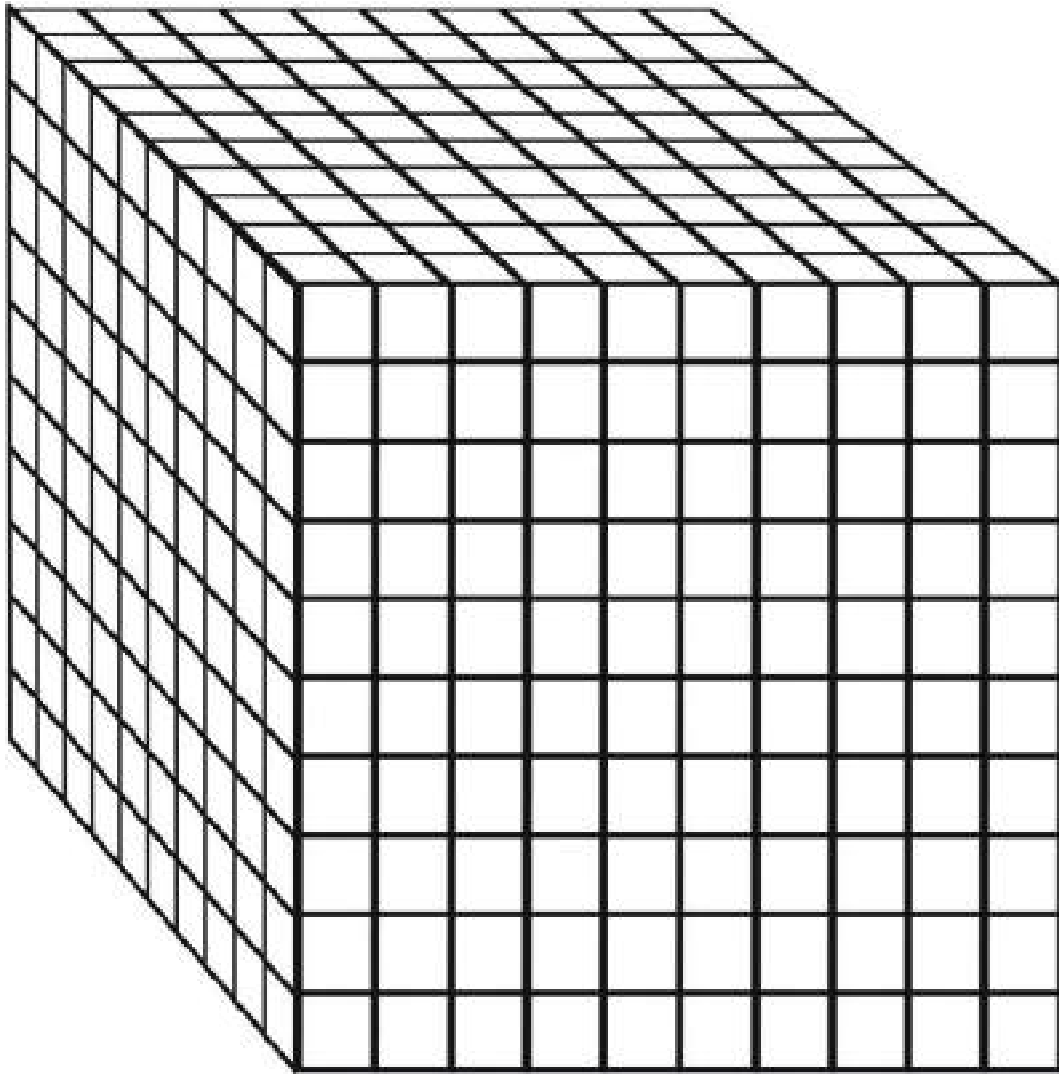










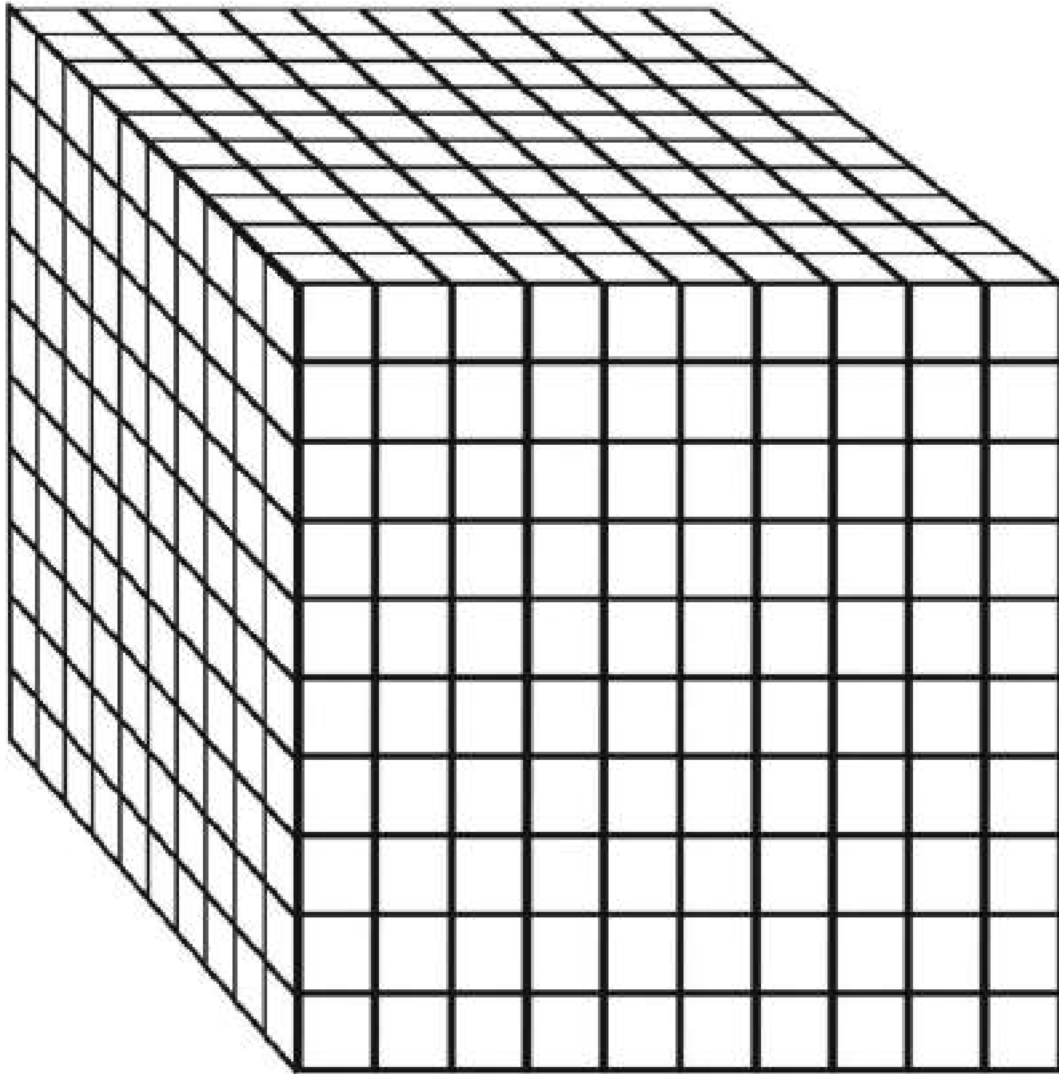















More or Less Than 1,000?

Dates on a tree

Note: There are approximately 23 medjool dates in a pound. At peak maturity, a date tree can produce 200 pounds of dates a year. In this photo, there could be up to 4,000 dates, so this could cause some interesting discussion!



Grains of rice in a kg bag

Note: In a 1 kg bag of rice, there are approximately 50,000 grains of rice.



Runners in a race

Note: This one can also cause a lot of discussion! Some marathons have ten thousand runners while others have less than 100.



Multiplication Cards – 1

1 x 5 =	1 x 5 =
2 x 9 =	2 x 9 =
5 x 6 =	5 x 6 =
4 x 6 =	4 x 6 =
6 x 3 =	6 x 3 =
10 x 7 =	10 x 7 =
9 x 8 =	9 x 8 =
6 x 7 =	6 x 7 =

7 x 6 =	7 x 6 =
8 x 5 =	8 x 5 =
5 x 5 =	5 x 5 =
4 x 8 =	4 x 8 =
6 x 2 =	6 x 2 =
10 x 3 =	10 x 3 =
1 x 8 =	1 x 8 =
2 x 3 =	2 x 3 =

Number Cards 1-10

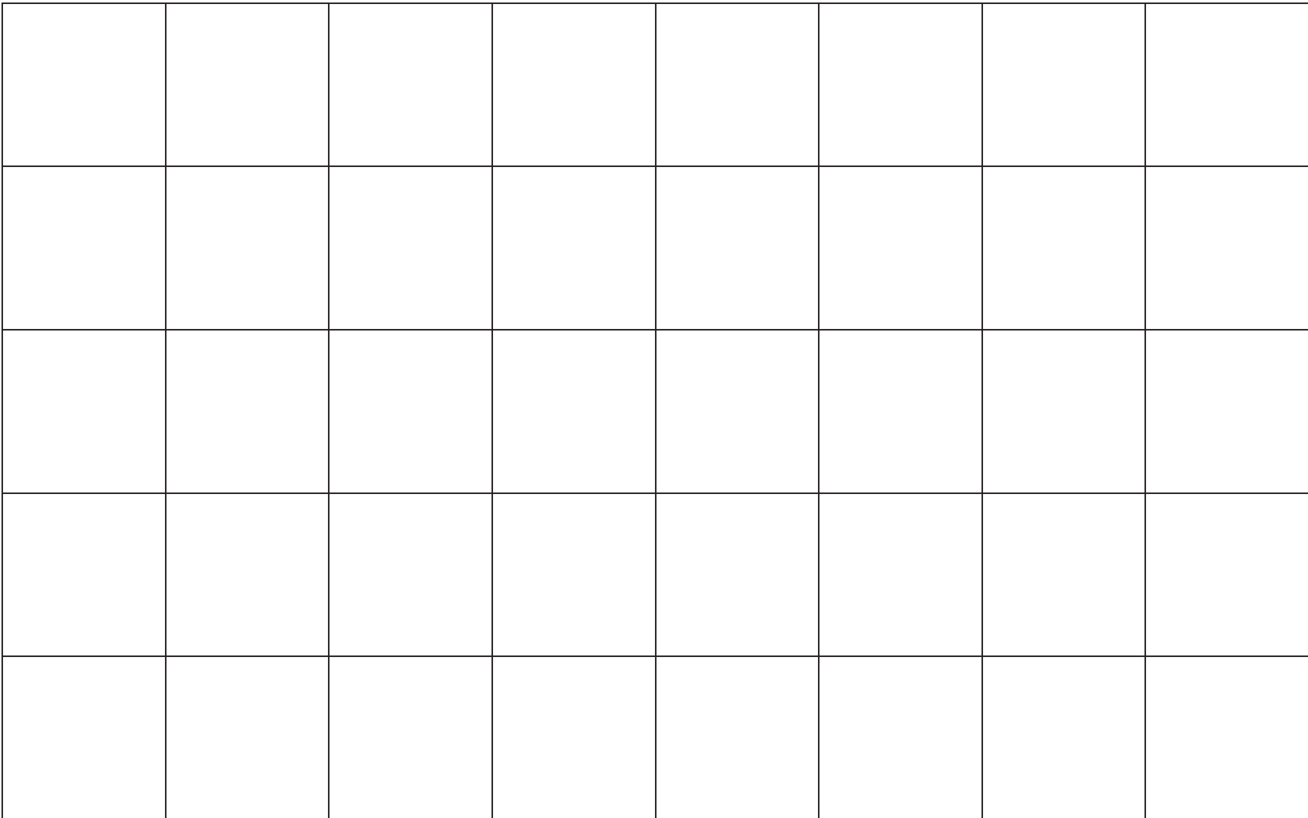
1	2	3
4	5	6
7	8	9
10		

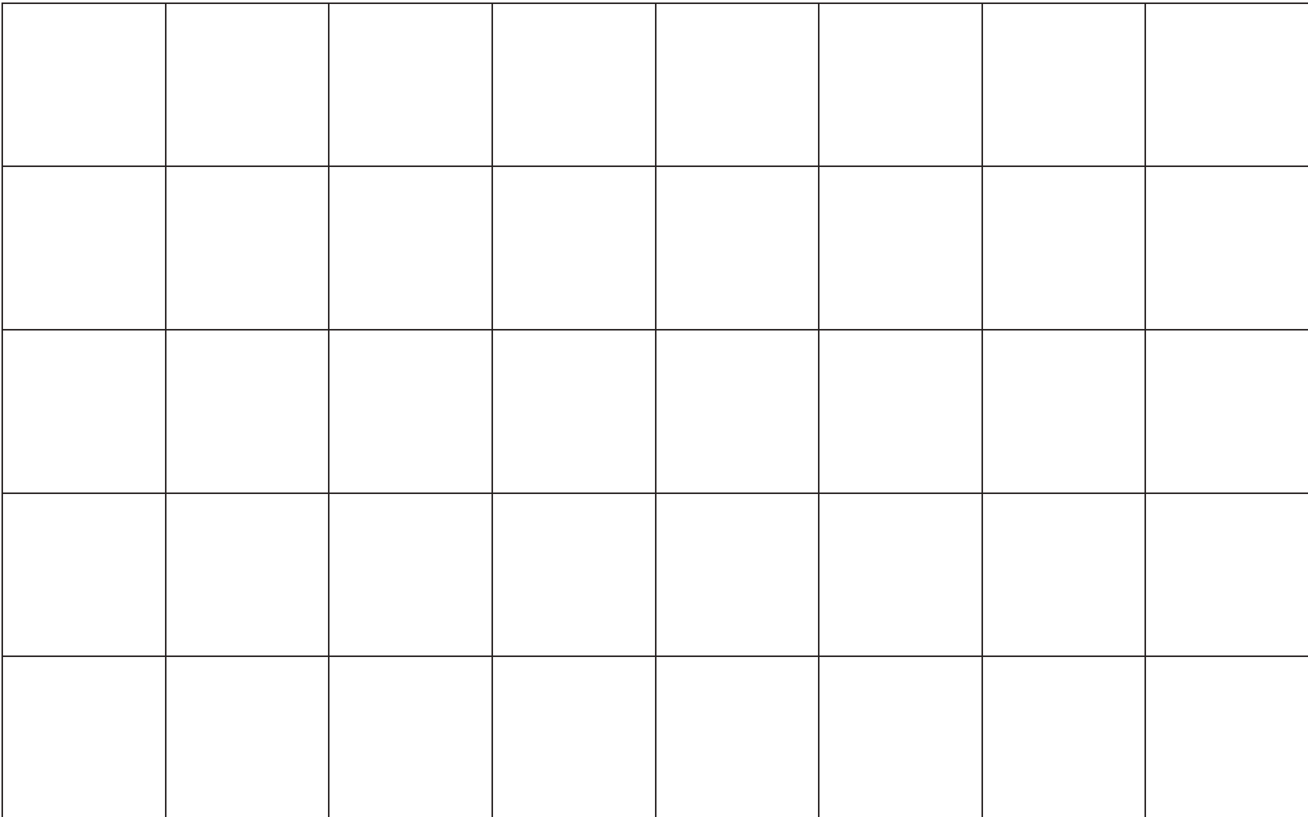
Number Cards 0-12

0	1	2
3	4	5
6	7	8
9	10	11

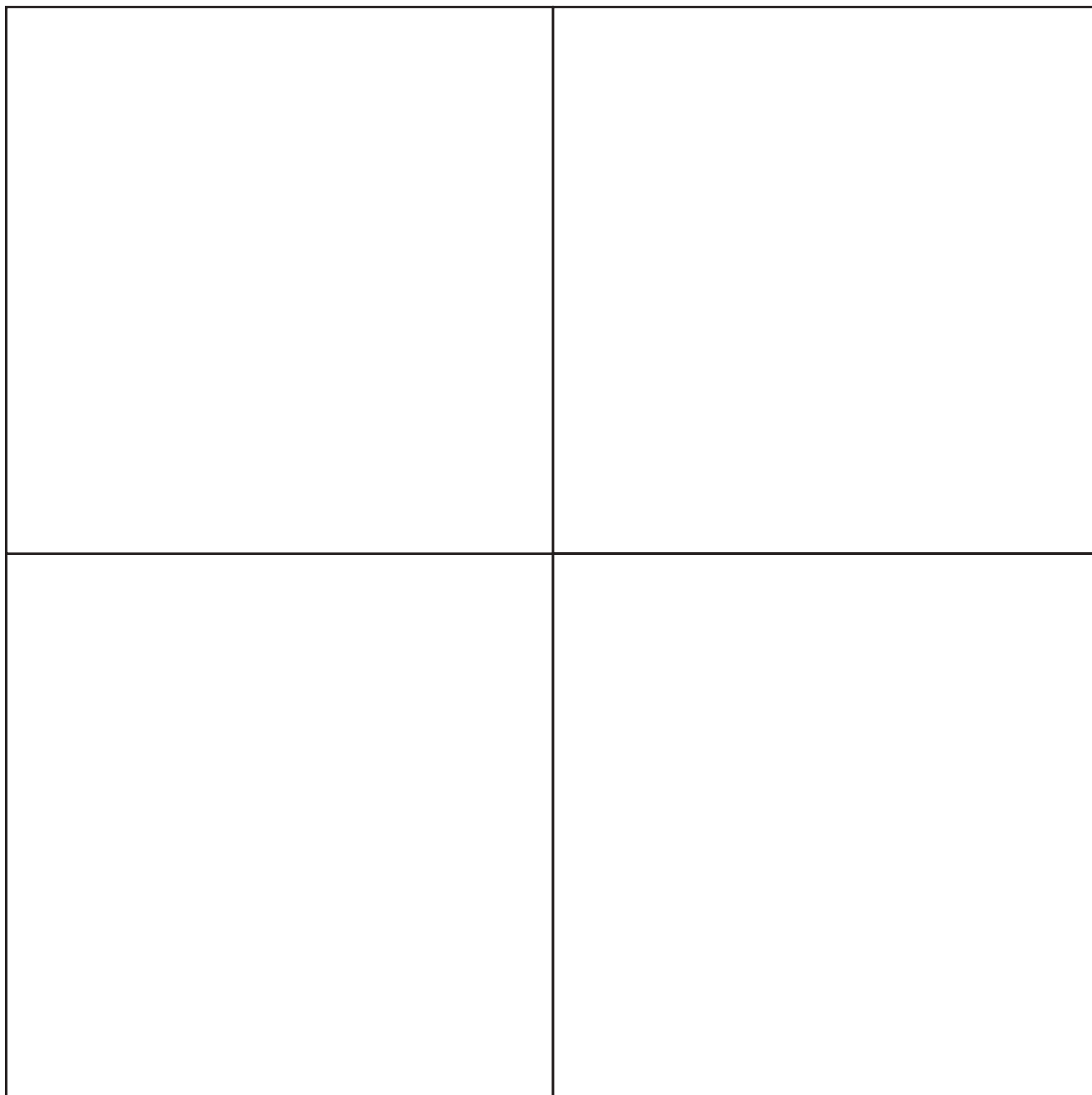
12		

2-Centimeter Grid
(Four 45-square sets)





Perimeter and Area Squares



Grocery Store



MULTIPLICATION PRACTICE: 4s

Directions: Use the 120 Chart to complete the following:

- Color the multiples of 4 ____________________ (color stated by teacher).
- Record them below. The first two have been done for you.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

4 x 1 = 4

4 x 2 = 8

4 x 3 = _____

4 x 4 = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

4 x _____ = _____

MULTIPLICATION PRACTICE: 6s

Directions: Use the 120 Chart to complete the following:

- Color the multiples of 6 ____________________ (color stated by teacher).
- Record them below. The first two have been done for you.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

6 x 1 = 6

6 x 2 = 12

6 x 3 = _____

6 x 4 = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

6 x _____ = _____

MULTIPLICATION PRACTICE: 7s

Directions: Use the 120 Chart to complete the following:

- Color the multiples of 7 ___________________ (color stated by teacher).
- Record them below. The first two have been done for you.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
91	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
111	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**

7 x 1 = 7

7 x 2 = 14

7 x 3 = _____

7 x 4 = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

7 x _____ = _____

MULTIPLICATION PRACTICE: 8s

Directions: Use the 120 Chart to complete the following:

- Color the multiples of 8 ____________________ (color stated by teacher).
- Record them below. The first two have been done for you.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

8 x 1 = 8

8 x 2 = 16

8 x 3 = _____

8 x 4 = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

8 x _____ = _____

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